Gulf of Mexico Coastal Ocean Observing System (GCOOS):

Data Management System Plan

(as of 2017-10-27)

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1. Overview

The *Gulf of Mexico Coastal Ocean Observing System* (GCOOS), a *Regional Coastal Ocean Observing System* (RCOOS) nested in a National Backbone of coastal observations, developed and maintains a centralized repository (hereafter referred to as the *Portal*). The *Portal* was designed and deployed to aggregate and disseminate the region's near real-time oceanographic data to provide timely information about the environment of the United States portion of the Gulf of Mexico and its estuaries to assist decision-makers, including researchers, government managers, industry, military, educators, emergency responders, and the general public. The data currently are from voluntary local (regional) data providers and federal observing facilities in the Gulf of Mexico.

The development and continuing maintenance of the *Portal* are part of the U.S. NOAA *Integrated Ocean Observing System* (IOOS), which is the U.S contribution to the international *Global Ocean Observing System* (GOOS) and the *Global Earth Observation System of Systems* (GEOSS). The GCOOS Data Management System was designed, built and configured to conform to the protocols, standards, and best practices promulgated by U.S. IOOS Program Office with guidance and expertise from the *Interagency Ocean Observation Committee* (IOOC).

The *Portal* and supplemental data repositories to support GCOOS goals and objectives, such as the *Hypoxia-Nutrient Data Portal* (nutrients.gcoos.org), were developed to facilitate the sharing of data, model outputs, and related products for the benefit of all stakeholders. The data in the *Portal* is licensed under the *Creative Commons by Attribution International* or CC-by-4.0 (https://creativecommons.org/licenses/by/4.0/legalcode) giving data users free access to the data in GCOOS data servers. These information systems support GCOOS primary mission to establish a sustained observing system for the Gulf of Mexico and provide observations and products needed by users in this region for:

- Detecting and predicting climate variability and consequences,
- Preserving and restoring healthy marine ecosystems,
- Ensuring human health,
- Managing resources,
- Facilitating safe and efficient marine transportation,
- Enhancing national security, and
- Predicting and mitigating against coastal hazards.

The deployed and operational version of the *Portal* is an automated computerized network-accessible data collection and delivery system. These data sources are maintained under a variety of data standards and archival schemas, and the *Portal* serves as the interface to these data, model output, and products via automated standards-based machine-to-machine (M2M) service interfaces, and through web-based human-accessible graphical user interfaces (i.e., HTML standards). The same set of services provide features that facilitate interoperability with other regional data systems, as well as with the federal backbone comprised of systems typified by, but not limited to, that of the *National Data Buoy Center* (NDBC).

2. Local Data Nodes and Data Sources

GCOOS does not own or operate any observing system assets. GCOOS collects data from 1,655 sensors located at 163 non-federal and 159 federal stations. Figure 2.1 shows the percentage of sensors by parameter type. Figure 2.2 shows the percent of sensors by data provider. Table 2.1 is a list of non-federal (also known as local data nodes) stations and the parameters available. Table 2.2 is a list of federal station and the parameters measured.

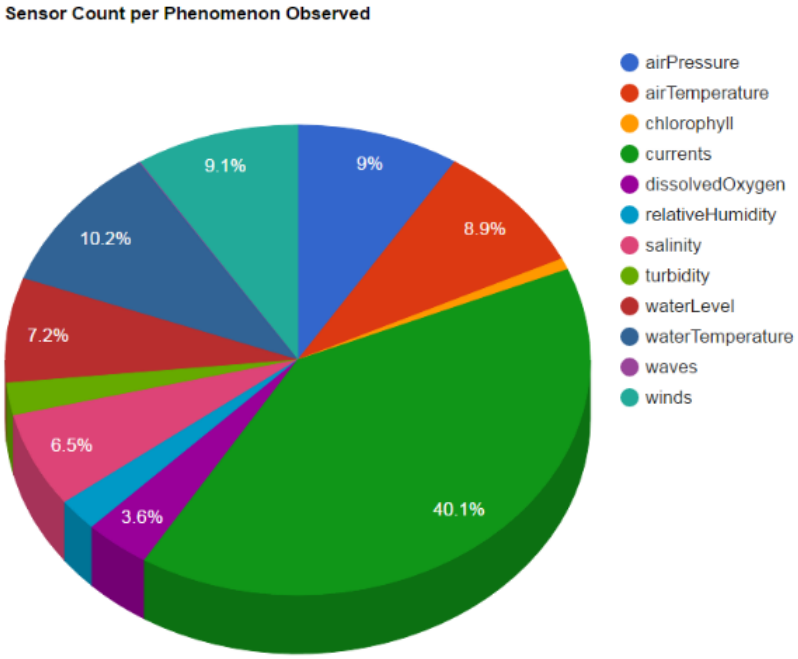

Figure 2.1. Percentage of sensors by parameter type.

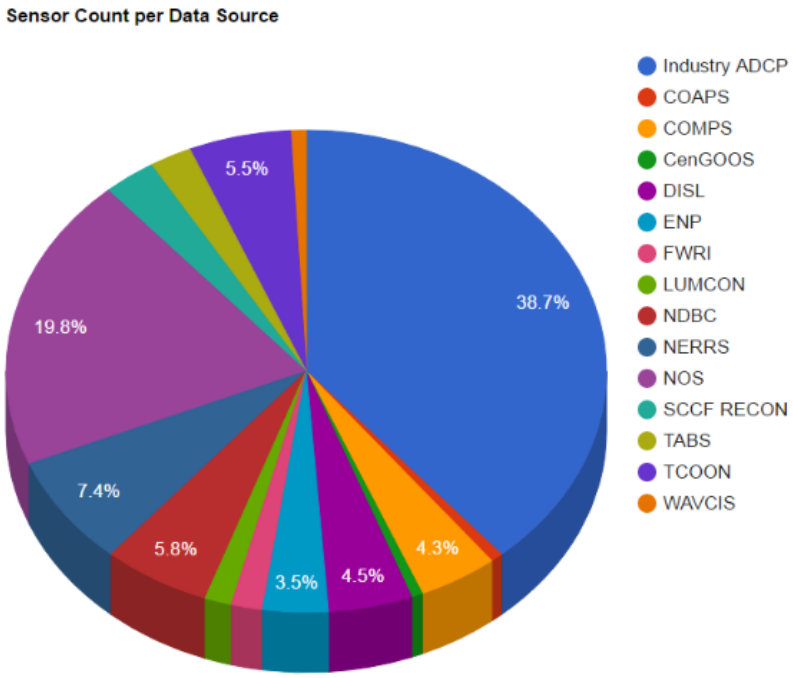

Figure 2.2. Percentage of sensors by observing system operators.

Table 2.1. List of Local Data Node stations (non-federal assets).

Data Source	Platform/Station	Lat	Lon	Observation(s)[1]
Center for Ocean-Atmospheric Prediction Studies (COAPS)	Tower No. N7	29.6619	-84.3731	airPressure, airTemperature, dewTemperature, relativeHumidity, salinity, waterTemperature, winds
Coastal Ocean Monitoring and Prediction System (COMPS)	C10: Navy-2	27.169	-82.926	airPressure, airTemperature, currents, relativeHumidity, salinity, waterTemperature, winds
	C12: West Florida Central Buoy	27.498	-83.722	airPressure, airTemperature, currents, relativeHumidity, salinity, winds
	C13: West Florida South Buoy	26.063	-83.073	airPressure, airTemperature, relativeHumidity

[1] Table 2.3 maps the equivalent CF-conformance equivalent of the abbreviated listing in Tables 2.1 and 2.2.

	EGK: Egmont Key, FL	27.601	-82.751	airPressure, airTemperature, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	FHP: Fred Howard Park, FL	28.153	-82.801	airPressure, airTemperature, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	NFB: Northwest Florida Bay, FL	25.084	-81.096	airPressure, airTemperature, relativeHumidity, salinity, waterTemperature, winds
	CPK: Campbell Park, FL	27.765	-82.649	airPressure, airTemperature, relativeHumidity, salinity, winds
	APK: Aripeka, FL	28.433	-82.667	airPressure, airTemperature, relativeHumidity, waterLevel, winds
	BCP: Big Carlos Pass, FL	26.404	-81.881	airPressure, airTemperature, relativeHumidity, waterLevel, winds
	SHP: Shell Point, FL	30.06	-84.291	airPressure, airTemperature, relativeHumidity, waterLevel, winds
	TAS: Tarpon Springs, FL	28.156	-82.758	airPressure, airTemperature, relativeHumidity, waterLevel, winds
	ANC: Anclote Gulf Park, FL	28.193	-82.789	airPressure, airTemperature, salinity, waterLevel, waterTemperature, winds
	ANM: Anna Maria, FL	27.54	-82.74	airPressure, airTemperature, waterLevel, winds
Central Gulf Ocean Observing System (CenGOOS)	USM3M02: 42067 - USM3M02	30.043	-88.649	airPressure, airTemperature, currents, relativeHumidity, salinity, waterTemperature, waves, winds
Dauphin Island Sea Laboratory (DISL)	BSCA: Station Bon Secour, LA	30.3288	-87.8293	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	CATA: Cedar Point, AL	30.3085	-88.1395	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	DISL: Dauphin Island, AL	30.2513	-88.0778	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds

	KATA: Katrina Cut, AL	30.2583	-88.2131	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	MBLA: Middle Bay Light, AL	30.4367	-88.0117	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	PPTA: Perdido Pass, AL	30.2791	-87.5561	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	MHPA: Meaher Park, AL	30.6671	-87.9365	airPressure, airTemperature, dissolvedOxygen, salinity, waterLevel, waterTemperature, winds
Florida Fish and Wildlife Research Institute (FWRI)	FWRI OTB: Old Tampa Bay	27.932003	-82.647455	airPressure, airTemperature, chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature, winds
	FWRI MTB: Middle Tampa Bay	27.661	-82.594	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	FWRI NPD: New Pass Dock	27.333752	-82.579374	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
Louisiana Universities Marine Consortium (LUMCON)	101: LUMCON Marine Center, LA	29.25333	-90.66333	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterTemperature, winds
	103: Western Lake Ponchartrain, LA	30.18894	-90.16831	airPressure, airTemperature, relativeHumidity, salinity, waterLevel, waterTemperature, winds
	102: Terrebonne Bay, LA	29.187	-90.6093	airTemperature, relativeHumidity, salinity, waterTemperature, winds
	105: Tambour Bay, LA	29.18737	-90.66542	airTemperature, relativeHumidity, waterLevel, winds
	104: MissRiver-Audobon	29.5526	-90.807	salinity
Oil and Petroleum Industry Participating Platforms (ADCP)	42361 - Auger - Garden Banks 426	27.550	-92.490	airPressure, airTemperature, dewPoint, winds, currents
	42362 - Brutus - Green Canyon 158	27.795	-90.648	airPressure, airTemperature, dewPoint, winds, currents
	42363 - Mars - Mississippi Canyon 807	28.160	-89.220	waterTemperature, currents

	42364 - Ram-Powell - Viosca Knoll 936	29.060	-88.090	airPressure, airTemperature, dewPoint, winds, currents
	42365 - Ursa - Mississippi Canyon 809	28.200	-89.120	airTemperature, dewPoint, waterTemperature, currents
	42366 - Red Hawk - Garden Banks 877	27.122	-91.959	currents
	42368 - Magnolia - Garden Banks 783	27.204	-92.203	waterTemperature, currents
	42370 - Holstein - Green Canyon 645	27.322	-90.536	airPressure, airTemperature, dewPoint, winds, waterTemperature, currents
	42371 – Typhoon – Green Canyon 237	27.732	-91.111	waterTemperature ,currents
	42372 - Genesis - Green Canyon 205	27.780	-90.518	waterTemperature , currents
	42374 - Horn Mountain - Mississippi Canyon 126 and 127	28.866	-88.056	waterTemperature, winds, currents, waves
	42375 - Na Kika - Mississippi Canyon 474	28.521	-88.289	currents, waves
	42377 - Constitution - Green Canyon 680	27.293	-90.968	waterTemperature , currents
	42379 - Marco Polo - Green Canyon 608	27.362	-90.181	currents
	42380 - Devil's Tower - Mississippi Canyon 773\	28.209	-88.737	currents
	42381 - Innovator - Mississippi Canyon 711	28.221	-89.615	waterTemperature , currents
	42382 - Gunnison - Garden Banks 668	27.304	-93.538	waterTemperature, currents
	42383 - Neptune - Green Canyon 613	27.37	-89.924	waterTemperature, currents
	42385 - Blind Faith - Mississippi Canyon 696	28.34	-88.266	waterTemperature, currents
	42386 - Tahiti - Green Canyon 641	27.326	-90.714	waterTemperature, currents
	42387 - Thunderhawk - Mississippi Canyon 734	28.267	-88.399	currents
	42390 - Perdido Host - Alaminos Canyon 857	26.129	-94.898	airPressure, airTemperature, dewPoint, waterTemperature, winds, currents
	42391 - Titan - Mississippi Canyon 941	28.034	-89.101	waterTemperature, currents
	42861 - Deepwater Nautilus - Mississippi Canyon 657	28.369 {mobile}	-87.924 {mobile}	waterTemperature, currents
	42862 – Noble Jim Thompson – Garden Banks 427	27.57 {mobile}	-92.396 {mobile}	waterTemperature, currents
	42863 - Ocean Victory - Mississippi Canyon 26	28.962 {mobile}	-88.696 {mobile}	waterTemperature, currents
	42867 – Discoverer Deep Seas – Mississippi Canyon 819	28.183 {mobile}	-88.629 {mobile}	waterTemperature, currents

	42868 - Discoverer Enterprise - Mississippi Canyon 777	28.214 {mobile}	-88.519 {mobile}	waterTemperature, currents
	42871 – GSF CR Luigs – Atwater Valley 617	27.331 {mobile}	-89.878 {mobile}	waterTemperature, currents
	42875 – Noble Amos Runner - Mississippi Canyon 794	28.154 {mobile}	-89.836 {mobile}	waterTemperature, currents
	42887 - Thunder Horse Semisub- Mississippi Canyon 778	28.191 {mobile}	-88.496 {mobile}	airTemperature, dewPoint, waterTemperature, winds, waves, currents
	42889 - Medusa SPAR - Mississippi Canyon 582A	28.394 {mobile}	-89.465 {mobile}	currents
	42890 - Front Runner SPAR - Green Canyon 338A	27.625 {mobile}	-90.441 {mobile}	waterTemperature, currents
	42891 – West Vela – Mississippi Canyon 775	28.193 {mobile}	-88.610	currents, waterTemperature
	42892 - Ocean Baroness - Garden Banks 386	27.599 {mobile}	-92.298 {mobile}	currents
	42894 – Noble Lorris Bouzigard - Mississippi Canyon 199	28.770 {mobile}	-88.834 {mobile}	Currents
	42897 – GSF Development Driller 1 – Atwater Valley 575	27.355 {mobile}	-89.797 {mobile}	currents
	42898 – Rowan Reliance – Keathly Canyon 129	27.026 {mobile}	-92.237 {mobile}	currents, waterTemperature
	42899 - Ocean Endeavor - Keathley Canyon 919	26.066 {mobile}	-92.060 {mobile}	currents
	42902 – Deepwater Proteus - Green Canyon 376	27.560 {mobile}	-90.749 {mobile}	airPressure, airTemperature, dewPoint, winds, currents
	42904 - Independence Hub - Mississippi Canyon 920	28.085 {mobile}	-87.986 {mobile}	currents, waterTemperature
	42905 - Belford Dolphin - Green Canyon 561#2	27.396 {mobile}	-90.305 {mobile}	currents, waterTemperature
	42908 - West Sirius - Keathley Canyon 57	26.909 {mobile}	-93.305 {mobile}	currents, waterTemperature
	42909 - ENSCO 8500 - Walker Ridge 772	28.201 {mobile}	-88.752 {mobile}	currents, waterTemperature
	42910 - Noble Driller - Green Canyon 113	27.847 {mobile}	-90.719 {mobile}	currents
	42911 - Ocean Monarch - Garden Banks 515#3	27.464 {mobile}	-92.433 {mobile}	currents, waterTemperature
	42912 - Discoverer Clear Leader – Walker Ridge 758	26.208 {mobile}	-91.443 {mobile}	currents, waterTemperature
	42913 - ENSCO 8501 - Mississippi Canyon 479	28.509 {mobile}	-88.031 {mobile}	currents, waterTemperature
	42914 - Discoverer Americas - Walker Ridge 160	26.806 {mobile}	-90.567 {mobile}	currents, waterTemperature
	42915 - Maersk Developer - Mississippi Canyon 726	28.010 {mobile}	-89.043 {mobile}	currents, waterTemperature
	42916 - Development Driller III - Mississippi Canyon 562	28.445 {mobile}	-88.277 {mobile}	currents, waterTemperature
	42917 - Discoverer Inspiration - Green Canyon 640	27.359 {mobile}	-90.743 {mobile}	currents, waterTemperature

	42918 - Noble Danny Adkins - Green Canyon 280	27.691 {mobile}	-91.114 {mobile}	currents, waterTemperature
	42919 - Stenna Forth - Mississippi Canyon 725	28.260 {mobile}	-88.885 {mobile}	currents, waterTemperature
	42921 - Deepwater Pathfinder - DeSoto Canyon 618#1	28.354 {mobile}	-87.820 {mobile}	currents, waterTemperature
	42923 - ENSCO 8502 - Green Canyon 237	27.747 {mobile}	-91.088 {mobile}	currents, waterTemperature
	42369 – Mad Dog DPS – Green Canyon 782	27.207	-90.283	currents, waterTemperature, winds, waves, airTemperature, waterTemperature
	42373 – Boomvang – East Breaks 643	27.354	-94.625	currents, waterTemperature
	42393 – Shenzi TLP – Green Canyon 653	27.301	-90.135	currents, waterTemperature
	42394 – Olympus TLP – Mississippi Canyon 807	28.160 {mobile}	-89.240 {mobile}	airPressure, airTemperature, dewPoint, winds, currents
	42388 – Helix Producer 1 – Green Canyon 237	27.730 {mobile}	-91.109 {mobile}	currents, waterTemperature
	42851 – Noble Globetrotter I – Mississippi Canyon 566	28.437 {mobile}	-88.102 {mobile}	currents, waterTemperature
	42852 – WHO Dat FPS – Mississippi Canyon 547	28.501 {mobile}	-89.769 {mobile}	currents, waterTemperature
	42857 – Noble Don Taylor – Mississippi Canyon 812	28.175 {mobile}	-88.961 {mobile}	currents, waterTemperature
	42864 – Thalassa – Walker Ridge 464	26.455 {mobile}	-90.777 {mobile}	currents, waterTemperature
	42865 – Ocean Black Hornet – Green Canyon 727	27.231 {mobile}	-90.790 {mobile}	currents, waterTemperature
	42876 – Deepwater Conqueror 678	26.297 {mobile}	-91.094 {mobile}	currents, waterTemperature
	42878 – Noble Paul Romano – Garden Banks 215	27.782 {mobile}	92.019 {mobile}	currents, waterTemperature
	42880 – West Auriga – Green Canyon 743	27.224 {mobile}	-90.032 {mobile}	currents, waterTemperature
	42884 – Ocean Blackhawk – Walker Ridge 52	26.913 {mobile}	-91.557 {mobile}	currents, waterTemperature
	42927 – Noble Bully I – Mississippi Canyon 567	28.418 {mobile}	-88.032 {mobile}	currents, waterTemperature
	42929 – Pacific Santa Ana – Keathley Canyon 10	26.949 {mobile}	-93.442 {mobile}	currents, waterTemperature
	42931 – Noble Bob Douglas – Green Canyon 895	27.115 {mobile}	-90.803 {mobile}	currents, waterTemperature
	42934 – Pacific Sharav – Green Canyon 807	27.160 {mobile}	-91.206 {mobile}	currents, waterTemperature
	42935 – Tubular Bells SPAR – Green Canyon 724	28.235 {mobile}	-88.995 {mobile}	currents, waterTemperature
	42936 – Rowan Resolute – Lloyd Ridge 1	27.962 {mobile}	-87.864 {mobile}	currents, waterTemperature
	42937 – Maersk Viking – Walker Ridge 584	26.384 {mobile}	-91.367 {mobile}	currents, waterTemperature
	42940 – West Neptune – Missisippi Canyon 427	28.549 {mobile}	-88.451 {mobile}	currents
	42367 – Matterhorn TLP – Mississippi Canyon 243	28.742	-88.826	currents

	42376 – Marlin TPL – Viosca Knoll 915	29.108	87.944	airPressure, airTemperature, dewPoint, winds, currents
	42384 – Prince TPL – Ewing Bank 1003	27.993	-90.326	currents
	42395 – Shell Alcyone Buoy – Walker Ridge 552	26.404	-90.792	airPressure, airTemperature, dewPoint, winds, currents
	42396 – Jack and St Malo FPU – Walker Ridge Block 758	26.235	-91.261	currents, waterTemperature
	42397 – Delta House FPU – Mississippi Canyon 254	28.755	-88.267	currents
	42398 – Lucius SPAR – Mississippi Canyon 857	26.132	-92.040	currents, waterTemperature
	42399 – Heidelberg – Green Canyon 860	27.111	-92.040	currents, waterTemperature
	42853 – West Capricorn – Green Canyon 627	27.331 {mobile}	-91.391 {mobile}	currents, waterTemperature
	42854 – Atwood Condor – Green Canyon 199	27.768 {mobile}	90.798 {mobile}	currents, waterTemperature
	42855 – ENSCO 8506 – Mississippi Canyon 772	28.201 {mobile}	-88.766 {mobile}	currents, waterTemperature
	42856 – Titanium Explorer – Walker Ridge 425	26.520 {mobile}	-90.531 {mobile}	currents, waterTemperature
	42858 – Stena IdeMAX – Atwater Valley 18	27.962 {mobile}	-89.048 {mobile}	currents, waterTemperature
	42859 – Discoverer 534 – Green Canyon 516	27.514 {mobile}	-90.376 {mobile}	currents, waterTemperature
	42860 – Atwood Advantage – Mississippi Canyon 40	27.937 {mobile}	-90.010 {mobile}	currents, waterTemperature
	42866 – Transocean Amirante – Mississippi Canyon 460	28.491 {mobile}	-88.997 {mobile}	currents
	42869 – Ocean Confidence – Mississippi Canyon 305#2	28.695 {mobile}	-87.931 {mobile}	currents
	42870 – Ocean America – Green Canyon 505	27.458 {mobile}	-90.884 {mobile}	currents
	42872 – Deepwater Horizon	28.738 {mobile}	-88.366 {mobile}	currents
	42873 – Ocean Quest – Mississippi Canyon	28.252 {mobile}	-89.622 {mobile}	currents, waterTemperature
	42874 – Deepwater Asgard – Mississippi Canyon 122	28.849 {mobile}	88.313 {mobile}	currents, waterTemperature
	42877 – Cajun Express – Mississippi Canyon 762	28.180 {mobile}	-89.290 {mobile}	currents
	42881 – Transocean Marianas – Atwater Valley 428	27.554 {mobile}	-88.361 {mobile}	currents
	42882 – Ocean Valiant – East Breaks 646	27.339 {mobile}	-94.470 {mobile}	currents
	42883 – Maersk Valiant – Alaminos Canyon 475	26.515 {mobile}	-94.212 {mobile}	currents, waterTemperature
	42885 – GSF Development Driller II – Mississippi Canyon 727#2	28.249 {mobile}	-88.828 {mobile}	currents, waterTemperature
	42886 – Discoverer Spirit – Mississippi Canyon 762	28.170 {mobile}	-89.240 {mobile}	currents, waterTemperature
	42888 – Rowan Relentless – Mississippi Canyon 84	28.893 {mobile}	87.985 {mobile}	currents, waterTemperature

	42893 – ENSCO DS-3 – Green Canyon 825	27.146 {mobile}	-90.319 {mobile}	currents, waterTemperature
	42895 – Island Performer – Mississippi Canyon 730	28.273 {mobile}	-88.662 {mobile}	currents, waterTemperature
	42896 – Sevan Louisiana – Mississippi Canyon 427	28.549 {mobile}	-88.451 {mobile}	currents, waterTemperature
	42900 – Ocean Saratoga – Mississippi Canyon 583	28.360 {mobile}	89.423 {mobile}	currents
	42901 – Helix Q50000 – Mississippi Canyon 776	28.212 {mobile}	-88.557 {mobile}	currents, waterTemperature
	42903 – Rowan Renaissance – Keathly Canyon 686	26.312 {mobile}	-92.646 {mobile}	currents, waterTemperature
	42906 – Petrolia – Block Chapabil 1	19.633 {mobile}	-92.483 {mobile}	currents, waterTemperature
	42907 – Ocean Black Lion – Green Canyon 512	27.465 {mobile}	-90.566 {mobile}	currents
	42920 – ENSCO DS-4 – Keathly Canyon 93	26.865 {mobile}	-93.661 {mobile}	currents
	42922 – Noble Jim Day – Walker Ridge 508	26.449 {mobile}	-90.784 {mobile}	currents, waterTemperature
	42924 – ENSCO 8503 – Green Canyon 281	27.690 {mobile}	-91.116 {mobile}	currents, waterTemperature
	42925 – ENSCO DS-5 – Mississippi Canyon 697	28.301 {mobile}	-88.127 {mobile}	currents, waterTemperature
	42926 – Discoverer India – Keathly canyon 770	26.201 {mobile}	92.871 {mobile}	currents, waterTemperature
	42928 – DESCO 8505 – Mississippi Canyon 521	28.474 {mobile}	-88.150 {mobile}	currents, waterTemperature
	42930 – Deepwater Champion – Alaminos Canyon 65	26.906 {mobile}	-94.906 {mobile}	currents, waterTemperature
	42932 – Deepwater Invictus – Green Canyon 521	27.437 {mobile}	-90.145 {mobile}	currents, waterTemperature
	42933 – Noble Sam Croft – Green Canyon 643	27.333 {mobile}	-90.599 {mobile}	currents, waterTemperature
	42938 – Ocean Onyx – Mississippi Canyon 674	28.257 {mobile}	-89.274 {mobile}	currents, waterTemperature
	42939 – Noble Tom Madden – Mississippi Canyon 84	28.859 {mobile}	-88.044 {mobile}	currents
	WDEL1 - Shell West Delta 143	28.662	-89.551	airPressure, airTemperature, winds, dew point
Sanibel-Captiva Conservation Foundation (SCCF-RECON)	SCCF RECON Gulf of Mexico	26.43448	-81.9647	airPressure, chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	SCCF RECON Redfish Pass	26.55448	-82.17147	airPressure, chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	SCCF RECON Shell Point	26.52548	-82.00315	airPressure, chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature

	SCCF RECON Fort Myers	26.64934	-81.88097	airTemperature, chlorophyll, dewTemperature, dissolvedOxygen, relativeHumidity, salinity, turbidity, waterTemperature, winds
	SCCF RECON Beautiful Island	26.69549	-81.81381	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	SCCF RECON Blind Pass	26.49661	-82.14787	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	SCCF RECON McIntyre Creek	26.464487	-82.104367	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
	SCCF RECON Tarpon Bay	26.467907	-82.063099	chlorophyll, dissolvedOxygen, salinity, turbidity, waterTemperature
Texas Automated Buoy System (TABS)	TABS B: GA-252	28.9818	-94.9186	airPressure, airTemperature, currents, relativeHumidity, waterTemperature, winds
	TABS J: PS-1126	26.1914	-97.0507	airPressure, airTemperature, currents, relativeHumidity, waterTemperature, winds
	TABS K: PI-745	26.2168	-96.4998	airPressure, airTemperature, currents, relativeHumidity, waterTemperature, winds
	TABS N: HI-A595	27.8903	-94.0367	airPressure, airTemperature, currents, relativeHumidity, waterTemperature, winds
	TABS V: HI-A389	27.8966	-93.5973	airPressure, airTemperature, currents, relativeHumidity, waterTemperature, winds
	TABS D: TABS D	27.9396	-96.8429	currents, waterTemperature
	TABS F: TABS F	28.8425	-94.2433	currents, waterTemperature
	TABS R: TABS R	29.635	-93.6417	currents, waterTemperature
	TABS W: TABS W	28.3507	-96.0058	currents, waterTemperature
Texas Coastal Ocean Observation Network (TCOON)	146: MANERR Station 2 (Copano East): MANERR Station 2 (Copano East)	28.13235	-97.03445	airPressure, airTemperature, dissolvedOxygen, relativeHumidity, salinity, waterTemperature, winds
	003: Rincon del San Jose (87778121): Rincon del San Jose; Potrero Lopeno SW, TX	26.8015	-97.4706	airPressure, airTemperature, waterLevel, waterTemperature, winds
	005: Packery Channel (87757921): Packery Channel, TX	27.6346	-97.237	airPressure, airTemperature, waterLevel, waterTemperature, winds
	006: Ingleside (87752831): Port Ingleside, TX	27.8217	-97.204	airPressure, airTemperature, waterLevel, waterTemperature, winds

	009: Port Aransas (87752371): Port Aransas, TX	27.8398	-97.0727	airPressure, airTemperature, waterLevel, waterTemperature, winds
	013: S. Bird Island (87761391): South Bird Island, TX	27.4847	-97.3181	airPressure, airTemperature, waterLevel, waterTemperature, winds
	031: Seadrift (87730371): Seadrift, TX	28.4073	-96.7122	airPressure, airTemperature, waterLevel, waterTemperature, winds
	057: Port O'Connor (87737011): Matagorda Bay; Port O'Connor, TX	28.446	-96.3961	airPressure, airTemperature, waterLevel, waterTemperature, winds
	068: Baffin Bay (87766041): Baffin Bay; Point of Rocks, TX	27.297	-97.4049	airPressure, airTemperature, waterLevel, waterTemperature, winds
	518: Rollover Pass (87709711): Rollover Pass, TX	29.515	-94.5133	airPressure, airTemperature, waterLevel, waterTemperature, winds
	524: Port Arthur (87704751): Port Arthur, TX	29.8672	-93.931	airPressure, airTemperature, waterLevel, waterTemperature, winds
	127: Bahia Grande Water Quality Station 1: Bahia Grande Water Quality Station 1	28.25976	-96.77369	currents, dissolvedOxygen, salinity, waterTemperature
	072: SALT01 (Nueces Bay, Texas): SALT01 (Nueces Bay, Texas)	27.839194	-97.443972	dissolvedOxygen, salinity, waterTemperature
	074: SALT03 (Nueces Bay, Texas): SALT03 (Nueces Bay, Texas)	27.85155	-97.48203	dissolvedOxygen, salinity, waterTemperature
	147: MANERR Station 3 (Copano West): MANERR Station 3 (Copano West)	28.08405	-97.20094	dissolvedOxygen, salinity, waterTemperature
	148: MANERR Station 4 (Aransas Bay): MANERR Station 4 (Aransas Bay)	27.97985	-97.02879	dissolvedOxygen, salinity, waterTemperature
	149: MANERR Station 5 (Port Aransas): MANERR Station 5 (Port Aransas)	27.83826	-97.05029	dissolvedOxygen, salinity, waterTemperature
	170: National Park Service - Baffin Bay: National Park Service - Baffin Bay	27.29702	-97.40491	dissolvedOxygen, salinity, waterTemperature
	171: National Park Service - Bird Island: National Park Service - Bird Island	27.4847	-97.3181	dissolvedOxygen, salinity, waterTemperature
	041: Nueces Delta 1: Nueces Delta 1	27.88969	-97.59163	salinity
	042: Nueces Delta 2: Nueces Delta 2	27.8888	-97.5696	salinity, waterTemperature
	043: Nueces Delta 3: Nueces Delta 3	27.883783	-97.5332	salinity, waterTemperature

	076: SALT05 (Nueces River, Texas): SALT05 (Nueces River, Texas)	27.89183	-97.61045	salinity, waterTemperature
	079: SALT08: SALT08	27.87078	-97.5177	salinity, waterTemperature
Wave-Current-Surge Information System for Coastal Louisiana (WAVCIS)	CSI03: Marsh Island, LA	29.4412	-92.0613	airPressure, airTemperature, waterTemperature, winds, waves
	CSI06: South Timbalier Block 52, LA	28.8667	-90.4833	airPressure, airTemperature, waterTemperature, winds, waves
	CSI09: Grand Isle Blocks	29.1015	-89.9782	airPressure, airTemperature, waterTemperature, winds, waves
	CSI05: Isle Dernieres, LA	29.0533	-90.5333	waterTemperature, winds, waves
Scripps Institution of Oceanography	42099: 42099 - Offshore St. Petersburg, FL (144)	27.34	-84.275	waterTemperature, waves
Louisiana Offshore Oil Port (LOOP)	LOPL1: Louisiana Offshore Oil Port, LA	28.885	-90.025	winds, waves, airTemperature, airPressure

Table 2.2. List of federal assets that GCOOS is also aggregating data.

Data Source	Platform/Station	Lat	Lon	Observation(s)[2]
Everglades National Park (ENP)	BDVF1: Broad River, FL	25.478	-80.989	salinity, waterTemperature
	BNKF1: Butternut Key, FL	25.087	-80.519	salinity, waterTemperature
	BOBF1: Bob Allen, FL	25.027	-80.681	salinity, waterTemperature
	BWSF1: Blackwater Sound, FL	25.178	-80.438	salinity, waterTemperature
	CANF1: Cane Patch, FL	25.422	-80.942	salinity, waterTemperature
	CNBF1: Cannon Bay, FL	25.702	-81.186	salinity, waterTemperature
	CWAF1: Clear Water Pass, FL	25.297	-81.013	salinity, waterTemperature
	DKKF1: Duck Key, FL	25.18	-80.49	salinity, waterTemperature
	GBIF1: Gunboat Island, FL	25.378	-81.029	salinity, waterTemperature
	HCEF1: Highway Creek, FL	25.254	-80.444	salinity, waterTemperature
	JKYF1: Johnson Key, FL	25.053	-80.904	salinity, waterTemperature
	LBRF1: Broad River Lower, FL	25.484	-81.133	salinity, waterTemperature
	LBSF1: Little Blackwater, FL	25.214	-80.432	salinity, waterTemperature
	LMDF1: Little Madeira, FL	25.176	-80.633	salinity, waterTemperature
	LMRF1: Lostmans River, FL	25.556	-81.169	salinity, waterTemperature
	LRIF1: Lane River, FL	25.284	-80.894	salinity, waterTemperature
	LRKF1: Little Rabbit Key, FL	24.982	-80.826	salinity, waterTemperature
	LSNF1: Long Sound, FL	25.235	-80.457	salinity, waterTemperature
	MUKF1: Murray Key, FL	25.106	-80.942	salinity, waterTemperature
	PKYF1: Peterson Key, FL	24.918	-80.747	salinity, waterTemperature
	TCVF1: Trout Cove, FL	25.213	-80.533	salinity, waterTemperature
	TPEF1: Tarpon Bay East, FL	25.41	-80.964	salinity, waterTemperature
	TRRF1: Taylor River, FL	25.217	-80.65	salinity, waterTemperature
	WIWF1: Willy Willy, FL	25.587	-81.044	salinity, waterTemperature
	WPLF1: Watson Place, FL	25.71	-81.249	salinity, waterTemperature
	WWEF1: White Water -West, FL	25.232	-80.938	salinity, waterTemperature
	GBTF1: Garfield Bight, FL	25.167	-80.801	salinity, waterTemperature, waterLevel
	WRBF1: Whipray Basin, FL	25.072	-80.735	salinity, waterTemperature, winds
National Data Buoy Center, NOAA	42001: 42001 - MID GULF 180 nm South of Southwest Pass, LA	25.888	-89.658	airPressure, airTemperature, currents, waterTemperature, winds

[2] op. cit., p.4.

	42002: 42002 - W GULF 207 NM East of Brownsville, TX	26.091	-93.758	airPressure, airTemperature, currents, waterTemperature, winds
	42003: 42003 - E GULF 262 nm South of Panama City, FL	26.007	-85.648	airPressure, airTemperature, currents, waterTemperature, winds
	42020: 42020 - Corpus Christi, TX 50NM Southeast of Corpus Christi, TX	26.968	-96.694	airPressure, airTemperature, currents, waterTemperature, winds
	42036: 42036 - W. TAMPA 106NM West Northwest of Tampa, FL	28.5	-84.517	airPressure, airTemperature, currents, waterTemperature, winds
	42012: 42012 - Orange Beach AL Buoy	30.065	-87.555	airPressure, airTemperature, waterTemperature, winds
	42019: 42019 - Freeport, TX 60 NM South of Freeport, TX	27.907	-95.353	airPressure, airTemperature, waterTemperature, winds
	42035: 42035 - GALVESTON 22NM East of Galveston, TX	29.232	-94.413	airPressure, airTemperature, waterTemperature, winds
	42039: 42039 - PENSACOLA - 115NM East Southeast of Pensacola, FL	28.739	-86.006	airPressure, airTemperature, waterTemperature, winds
	42055: 42055 - Bay of Campeche	22.203	-94	airPressure, airTemperature, waterTemperature, winds
	42056: 42056 - Yucatan Basin	19.802	-84.857	airPressure, airTemperature, waterTemperature, winds
	42057: 42057 - Western Caribbean	17.002	-81.501	airPressure, airTemperature, waterTemperature, winds
	FWYF1: FWYF1 - Fowey Rocks, FL	25.591	-80.097	airPressure, airTemperature, waterTemperature, winds
	PTAT2: PTAT2 - Port Aransas, TX	27.826	-97.051	airPressure, airTemperature, waterTemperature, winds
	SAUF1: SAUF1 - St. Augustine, FL	29.857	-81.265	airPressure, airTemperature, waterTemperature, winds
	SGOF1: SGOF1 - Tyndall AFB Tower C (N4), FL	29.408	-84.858	airPressure, airTemperature, waterTemperature, winds
	VENF1: VENF1 - Venice, FL	27.072	-82.453	airPressure, airTemperature, waterTemperature, winds
	BURL1: BURL1 - Southwest Pass, LA	28.906	-89.429	airPressure, airTemperature, winds
	CDRF1: CDRF1 - Cedar Key, FL	29.136	-83.029	airPressure, airTemperature, winds
	KTNF1: KTNF1 - Keaton Beach, FL	29.819	-83.593	airPressure, airTemperature, winds
	PLSF1: PLSF1 - Pulaski Shoal Light, FL	24.693	-82.773	airPressure, airTemperature, winds
	SANF1: SANF1 - Sand Key, FL	24.456	-81.877	airPressure, airTemperature, winds
	SMKF1: SMKF1 - Sombrero Key, FL	24.628	-81.112	airPressure, airTemperature, winds
	SRST2: SRST2 - Sabine Pass, TX	29.683	-94.033	airPressure, airTemperature, winds

	42007: 42007 - BILOXI 22 nm South-Southeast of Biloxi, MS {disestablished, 2010}	30.09	-88.769	airTemperature,dewPoint, waterTemperature ,wavw,winds
	42040: 42040 – Luke Offshore – 63 NM South of Dauphin Is., AL	29.21	88.21	airPressure , airTemperature, dewTemperature, waterTemperature, winds
National Estuarine Research Reserve System, NOAA	apaebmet: East Bay	29.7909	-84.8834	airPressure, airTemperature, relativeHumidity, winds
	gndcrmet: Crooked Bayou	30.3592	-88.42	airPressure, airTemperature, relativeHumidity, winds
	marcemet: Copano East	28.1323	-97.0344	airPressure, airTemperature, relativeHumidity, winds
	rkbuhmet: Upper Henderson Creek	26.0501	-81.7017	airPressure, airTemperature, relativeHumidity, winds
	wkbshmet: Safe Harbor Met Station	30.4212	-87.8285	airPressure, airTemperature, relativeHumidity, winds
	gtmpcmet: Pellicer Creek	29.6577	-81.2327	airPressure, airTemperature, relativeHumidity, winds, dissolvedOxygen, salinity, turbidity, waterTemperature
	apacpwq: Cat Point	29.7021	-84.8802	dissolvedOxygen, salinity, turbidity, waterTemperature
	apadbwq: Dry Bar	29.6747	-85.0583	dissolvedOxygen, salinity, turbidity, waterTemperature
	apaebwq: East Bay Bottom	29.7858	-84.8752	dissolvedOxygen, salinity, turbidity, waterTemperature
	apaeswq: East Bay Surface	29.858	-84.8752	dissolvedOxygen, salinity, turbidity, waterTemperature
	gndbcwq: Bayou Cumbest	30.3836	-88.4364	dissolvedOxygen, salinity, turbidity, waterTemperature
	gndbhwq: Bayou Heron	30.4178	-88.4054	dissolvedOxygen, salinity, turbidity, waterTemperature
	gndblwq: Bangs Lake	30.3571	-88.4629	dissolvedOxygen, salinity, turbidity, waterTemperature
	gtmfmwq: Fort Matanzas	29.737	-81.2459	dissolvedOxygen, salinity, turbidity, waterTemperature
	gtmpiwq: Pine Island	30.0508	-81.3674	dissolvedOxygen, salinity, turbidity, waterTemperature
	gtmsswq: San Sebastian	29.8688	-81.3074	dissolvedOxygen, salinity, turbidity, waterTemperature
	marabwq: Aransas Bay	27.9798	-97.0287	dissolvedOxygen, salinity, turbidity, waterTemperature
	marcewq: Copano Bay East	28.1323	-97.0344	dissolvedOxygen, salinity, turbidity, waterTemperature
	marcwwq: Copano Bay West	28.0841	-97.2009	dissolvedOxygen, salinity, turbidity, waterTemperature
	marmbwq: Mesquite Bay	28.1384	-96.8285	dissolvedOxygen, salinity, turbidity, waterTemperature
	marscwq: Ship Channel	27.8383	-97.0503	dissolvedOxygen, salinity, turbidity, waterTemperature
	rkbfbwq: Fakahatchee Bay	25.8922	-81.477	dissolvedOxygen, salinity, turbidity, waterTemperature

	rkbfuwq: Faka Union Bay	25.9005	-81.5159	dissolvedOxygen, salinity, turbidity, waterTemperature
	rkblhwq: Lower Henderson Creek	26.0257	-81.7332	dissolvedOxygen, salinity, turbidity, waterTemperature
	rkbmbwq: Middle Blackwater River	25.9343	-81.5946	dissolvedOxygen, salinity, turbidity, waterTemperature
	wkbfrwq: Fish River	30.4162	-87.8228	dissolvedOxygen, salinity, turbidity, waterTemperature
	wkbmbwq: Middle Bay	30.39	-87.8177	dissolvedOxygen, salinity, turbidity, waterTemperature
	wkbmrwq: Magnolia River	30.39	-87.8177	dissolvedOxygen, salinity, turbidity, waterTemperature
	wkbwbwq: Weeks Bay	30.3808	-87.832	dissolvedOxygen, salinity, turbidity, waterTemperature
	gndpcwq: Point Aux Chenes Bay	30.3486	-88.4185	dissolvedOxygen, salinity, waterTemperature
National Ocean Service, NOAA	8778490: Port Mansfield, TX	26.5546	-97.4221	airPressure, airTemperature
	8737048: Mobile State Docks, AL	30.7083	-88.0433	airPressure, airTemperature, salinity, waterLevel, waterTemperature
	8764314: Eugene Istans, North of, LA	29.2675	-91.3839	airPressure, airTemperature, salinity, waterLevel, waterTemperature, winds
	8770613: Morgans Point, TX	29.6817	-94.985	airPressure, airTemperature, salinity, waterLevel, waterTemperature, winds
	8770777: Manchester, TX	29.7263	-95.2658	airPressure, airTemperature, waterLevel
	8771450: Galveston Pier 21, TX	29.31	-94.7933	airPressure, airTemperature, waterLevel
	8774513: Copano Bay, TX	28.1183	-97.0217	airPressure, airTemperature, waterLevel
	8767816: Lake Charles, LA	30.2236	-93.2217	airPressure, airTemperature, waterLevel, waterLevel
	8724580: Key West, FL	24.5557	-81.8079	airPressure, airTemperature, waterLevel, waterTemperature
	8726384: Port Manatee, FL	27.6387	-82.5621	airPressure, airTemperature, waterLevel, waterTemperature
	8723970: Vaca Key, FL	24.7117	-81.105	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8725110: Naples, FL	26.1317	-81.8075	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8725520: Fort Myers, FL	26.6477	-81.8712	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8726520: St. Petersburg, FL	27.7606	-82.6269	airPressure, airTemperature, waterLevel, waterTemperature, winds

	8726724: Clearwater Beach, FL	27.9783	-82.8317	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8728690: Apalachicola, FL	29.7267	-84.9817	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8729108: Panama City, FL	30.1523	-85.6669	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8729840: Pensacola, FL	30.4044	-87.2112	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8736897: Coast Guard Sector Mobile, AL	30.6483	-88.0583	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8747437: Bay Waveland Yacht Club, MS	30.3264	-89.3258	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8761305: Shell Beach, LA	29.8681	-89.6732	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8761927: New Canal, LA	30.0272	-90.1134	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8762482: Bayou Gauche, LA	29.7886	-90.4202	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8764227: Amerada Pass, LA	29.4496	-91.3381	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8768094: Calcasieu Pass, LA	29.7682	-93.3429	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8770570: Sabine Pass North, TX	29.7284	-93.8701	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8771013: Eagle Point, TX	29.48	-94.9183	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8772447: USCG Freeport, TX	28.9433	-95.3025	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8774770: Rockport, TX	28.0217	-97.0467	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8775870: Malaquite Beach (Corpus Christi), TX	27.58	-97.2167	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8779770: Port Isabel, TX	26.06	-97.215	airPressure, airTemperature, waterLevel, waterTemperature, winds
	8720030: Fernandina Beach, FL	30.6717	-81.465	airPressure, airTemperature, waterLevel, winds
	8720218: Mayport (Bar Pilots Dock), FL	30.3967	-81.43	airPressure, airTemperature, waterLevel, winds

	8721604: Trident Pier, FL	28.4158	-80.5931	airPressure, airTemperature, waterLevel, winds
	8722670: Lake Worth Pier, FL	26.6117	-80.0333	airPressure, airTemperature, waterLevel, winds
	8723214: Virginia Key, FL	25.7314	-80.1618	airPressure, airTemperature, waterLevel, winds
	8726607: Old Port Tampa, FL	27.8578	-82.5527	airPressure, airTemperature, waterLevel, winds
	8727520: Cedar Key, FL	29.135	-83.0317	airPressure, airTemperature, waterLevel, winds
	8729210: Panama City Beach, FL	30.2133	-85.8783	airPressure, airTemperature, waterLevel, winds
	8735180: Dauphin Island, AL	30.25	-88.075	airPressure, airTemperature, waterLevel, winds
	8760721: Pilottown, LA	29.1783	-89.2583	airPressure, airTemperature, waterLevel, winds
	8760922: Pilots Station East, SW Pass, LA	28.9322	-89.4075	airPressure, airTemperature, waterLevel, winds
	8761724: Grand Isle, LA	29.2633	-89.9567	airPressure, airTemperature, waterLevel, winds
	8764044: Berwick, LA	29.6675	-91.2376	airPressure, airTemperature, waterLevel, winds
	8766072: Freshwater Canal Locks, LA	29.555	-92.305	airPressure, airTemperature, waterLevel, winds
	8770733: Lynchburg Landing, TX	29.765	-95.078	airPressure, airTemperature, waterLevel, winds
	8770808: High Island, TX	29.593	-94.39	airPressure, airTemperature, waterLevel, winds
	8770822: Texas Point, Sabine Pass, TX	29.6893	-93.8418	airPressure, airTemperature, waterLevel, winds
	8770971: Rollover Pass, TX	29.515	-94.513	airPressure, airTemperature, waterLevel, winds
	8771341: Galveston Bay Entrance, North Jetty, TX	29.3573	-94.7248	airPressure, airTemperature, waterLevel, winds
	8771486: Galveston Railroad Bridge, TX	29.302	-94.897	airPressure, airTemperature, waterLevel, winds
	8771972: San Luis Pass, TX	29.095	-95.1133	airPressure, airTemperature, waterLevel, winds
	8772985: Sargent, TX	28.772	-95.617	airPressure, airTemperature, waterLevel, winds
	8773037: Seadrift, TX	28.408	-96.712	airPressure, airTemperature, waterLevel, winds
	8773146: East Matagorda, TX	28.71	-95.913	airPressure, airTemperature, waterLevel, winds
	8773259: Port Lavaca, TX	28.64	-96.595	airPressure, airTemperature, waterLevel, winds
	8774230: Aransas Wildlife Refuge, TX	28.228	-96.795	airPressure, airTemperature, waterLevel, winds
	8775237: Port Aransas, TX	27.8383	-97.0733	airPressure, airTemperature, waterLevel, winds

	8775283: Port Ingleside, Corpus Christi Bay, TX	27.822	-97.203	airPressure, airTemperature, waterLevel, winds
	8775792: Packery Channel, TX	27.6333	-97.2367	airPressure, airTemperature, waterLevel, winds
	8776604: Baffin Bay, TX	27.295	-97.405	airPressure, airTemperature, waterLevel, winds
	8779280: Realitos Peninsula, TX	26.2622	-97.2854	airPressure, airTemperature, waterLevel, winds
	8779748: South Padre Island Coast Guard Station, TX	26.077	-97.177	airPressure, airTemperature, waterLevel, winds
	8720357: I-295 Bridge, St Johns River, FL	30.1917	-81.6917	airPressure, airTemperature, waterLevel, winds, waterLevel
	8734673: Fort Morgan, AL	30.2283	-88.025	airPressure, airTemperature, winds
	8741003: Petit Bois Island, MS	30.2133	-88.5	airPressure, airTemperature, winds
	8741094: Range A rear, Pascagoula, MS	30.3433	-88.5117	airPressure, airTemperature, winds
	8741501: Dock C, Pascagoula, MS	30.355	-88.5667	airPressure, airTemperature, winds
	8776139: S. Bird Island, TX	27.48	-97.322	airPressure, airTemperature, winds
	8770475: Port Arthur, TX	29.8667	-93.93	airPressure, waterLevel, winds
	8775244: Nueces Bay, TX	27.8328	-97.4859	airPressure, waterLevel, winds
	8777812: Rincon Del San Jose, TX	26.825	-97.4917	airPressure, waterLevel, winds
	8772447: USCG Freeport, TX	28.9433	-95.3025	airTemperature, waterLevel, waterTemperature, winds
	lm0101: First Street Wharf	29.9224	-90.0711	currents
	mc0101: Atchfalaya Bar Channel, LA	29.3183	-91.4297	currents
	8720219: Dames Point, FL	30.3867	-81.5583	waterLevel
	8726667: Mckay Bay Entrance, FL	27.9133	-82.425	waterLevel
	8732828: Weeks Bay, AL	30.4167	-87.825	waterLevel
	8735391: Dog River Bridge, AL	30.5652	-88.088	waterLevel
	8735523: East Fowl River Bridge, AL	30.4437	-88.1139	waterLevel
	8737138: Chickasaw Creek, AL	30.7819	-88.0736	waterLevel
	8738043: West Fowl River Bridge, AL	30.3766	-88.1586	waterLevel
	8739803: Bayou La Batre Bridge, AL	30.4057	-88.2477	waterLevel

	8740166: Grand Bay Nerr, Mississippi Sound, MS	30.412	-88.402	waterLevel
	8741533: Pascagoula Noaa Lab, MS	30.3679	-88.563	waterLevel
	8761955: Carrollton, LA	29.9329	-90.1355	waterLevel
	8762075: Port Fourchon, LA	29.1142	-90.1992	waterLevel
	8767961: Bulk Terminal, LA	30.1903	-93.3007	waterLevel
	8770520: Rainbow Bridge, TX	29.98	-93.8817	waterLevel
	8741041: Dock E. Port of Pascagoula, MS	30.3477	-88.5054	waterLevel, waterTemperature
	8773701: Port Oconnor, TX	28.4517	-96.3883	waterLevel, winds
	8726669: Berth 223 Met, FL	27.9172	-82.4438	winds
	8726673: Seabulk, Tampa, FL	27.9233	-82.445	winds
	8726679: East Bay Causeway, FL	27.9289	-82.4258	winds
	8726694: TPA Cruise Terminal 2, Tampa, FL	27.9333	-82.4333	winds

The following is a list of the abbreviated observations listed in Tables 2.1 and 2.2 to CF-standard name and references.

Table 2.3. GCOOS abbreviated parameter labels to CF-standard names.

Abbreviated term	Full label	Definition
winds	wind_speed; wind_speed_of_gust; wind_to_direction	http://mmisw.org/ont/cf/parameter/wind_speed; http://mmisw.org/ont/cf/parameter/wind_speed_of_gust; http://mmisw.org/ont/cf/parameter/wind_to_direction
airPressure	air_pressure	http://mmisw.org/ont/cf/parameter/air_pressure
airTemperature	air_temperature	http://mmisw.org/ont/cf/parameter/air_temperature
waterTemperature	sea_water_temperature	http://mmisw.org/ont/cf/parameter/sea_water_temperature
relativeHumidity	relative_humidity	http://mmisw.org/ont/cf/parameter/relative_humidity
salinity	sea_water_practical_salinity	http://mmisw.org/ont/cf/parameter/sea_water_practical_salinity
currents	sea_water_speed; upward_sea_water_velocity; direction_of_sea_water_velocity	http://mmisw.org/ont/cf/parameter/sea_water_speed; http://mmisw.org/ont/cf/parameter/upward_sea_water_velocity; http://mmisw.org/ont/cf/parameter/direction_of_sea_water_velocity
waterLevel	sea_surface_height_above_sea_level	http://mmisw.org/ont/cf/parameter/sea_surface_height_above_sea_level
wave	signifcant_wave_height; signifcant_wave_to_direction; significant_wave_period	
chlorophyll	mass_concentration_of_chlorophyll_in_sea_water	http://mmisw.org/ont/cf/parameter/mass_concentration_of_chlorophyll_in_sea_water
phytoplankton	mass_concentration_of_phytoplankto_in_sea_water	
dewTemperature	dew_point_temperature	http://mmisw.org/ont/cf/parameter/dew_point_temperature
dissolvedOxygen	mass_concentration_of_oxygen_in_sea_water	http://mmisw.org/ont/cf/parameter/mass_concentration_of_oxygen_in_sea_water
turbidity	sea_water_turbidity	http://mmisw.org/ont/cf/parameter/sea_water_turbidity

3. Network and Communication

The *Gulf of Mexico Coastal and Ocean Observing System* (GCOOS) Data Portal is a network of distributed resources and part of a larger network of GCOOS RA resources (Figure 3.1). The central services are delivered from the Texas A&M University (TAMU), College Station facility. It is composed of six servers (see Appendices for technical details of Data Portal related servers) and 3 servers hosted by a network external to TAMU.

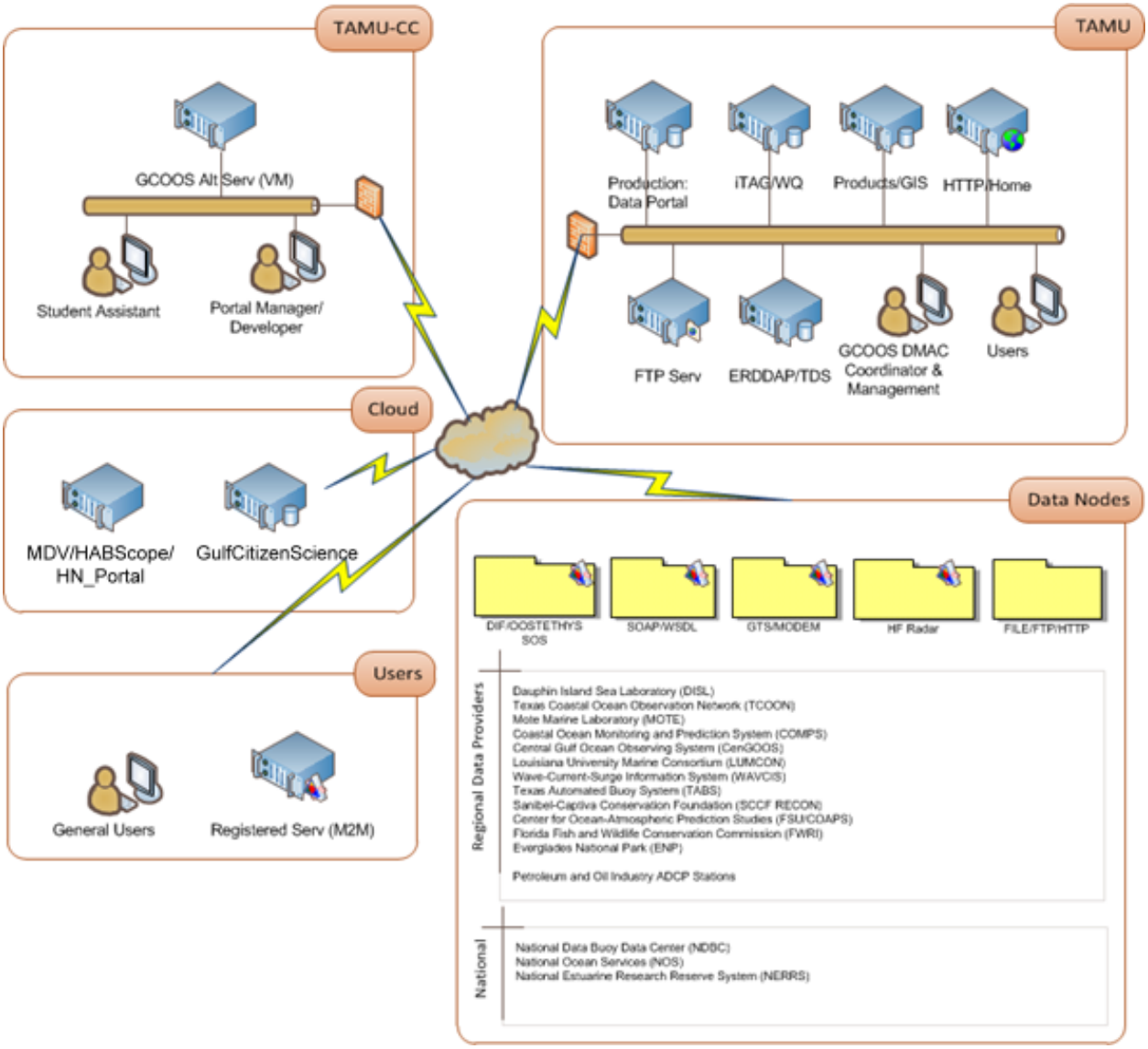

Figure 3.1. The Gulf of Mexico Coastal Ocean Observing System (GCOOS) distributed network.

Figure 3.2. Fifteen-story Eller Oceanography and Meteorology Building, Texas A&M University, College Station, TX, host GCOOS RA computer servers and network (Source: tamu.edu).

GCOOS' physical computer and server assets reside in the Geosciences Computer Center in the Eller Oceanography and Meteorology Building on the main campus of Texas A&M University. The servers may be transferred to the state of the art TAMU Dollar Data Center when it becomes operational in 2017. The server based in Texas A&M University Corpus Christi (TAMUCC) Data Center, serves as the alternate production server in cases where the network and communications to College Station, Texas are severed (see *Series 4. Disaster Management and Recovery*). The Information Technology Services (ITS) department of TAMUCC is one of many service departments of the University offering professional services to the enhancements and operations of the network and hardware infrastructure. It provides professional services to all staff and students and maintains the Network and Operations Center (NOC) and 10Gbps network backbone. The Data Center at the NOC provides n+1 cooling redundancy, n+1 power redundancy with a 250kVA Data Center class battery backup and generator, security access, and over 50+ IT professionals in support. The Data Center is 1,480 GFS with 925 GSF available for expansion, equipped with a 24x7 environmental monitoring and ECARO-25 fire suppression system. ITS also provide staff and project access to its scalable HP Gen8 and Gen9 Blades Hyper-V cluster for computing requirements and storage, and data backup services through it Quantum Scalar i6000 tape library.

The TAMU servers are also connected to 10GB networks backbone and secured through the University IT services that ensure compliance with rules and regulations as mandated by the State of Texas Department of Information Services and Texas A&M University System. The servers not within the TAMU and TAMUCC network are assessed separately and are required to follow the security protocols of TAMU System

before it will be allowed to communicate directly with TAMU and TAMUCC GCOOS servers.

3.1. Primary Web Server

This is the primary HTTP server (gcoos.org) that hosts the administrative and operational resources of the Regional Association of GCOOS. *WordPress Content Management System* is employed to serve the pages. Also, this server is the 'incoming-only' FTP server of GCOOS (ftp.gcoos.org) for data providers opting to push data to GCOOS using the FTP services. All incoming data are, in turn, also pushed to gcoos1 for proper handling. The following is the technical specifications and configuration of GCOOS Web Server (http://gcoos.org):

Server	gcoos
Domain	gcoos.org
Alternate	165.91.54.142
Purpose	Primary web server of GCOOS Regional Association
Physical location	Texas A&M University, College Station, TX
Operating System	Mac OS 10.11.x
CPU	4x4GB Intel Quad Xeon @ 3.2GHz
Total Memory	16GB
Total Storage	9TB
Services	HTTP, FTP, SFTP
Contact Name	Matthew Howard
Contact Email	mkhoward@tamu.edu

3.2. Primary Data Server

This is the primary GCOOS data server (data.gcoos.org) that collates and distributes near-real-time data (gcoos1.tamu.edu) from local data nodes via the Open Geospatial Consortium Sensor Observing Services (OGC SOS) standards and a direct access to the data (RESTful). The following is the technical specifications and configuration of GCOOS Web Server (http://data.gcoos.org):

Server	gcoos1
Domain	tamu.edu
Alternate	128.194.26.145
Purpose	Primary server for GCOOS Data Portal
Physical location	Texas A&M University, College Station, TX

Operating System	CentOS 7.2
CPU	6 x 16GB Intel(R) Xeon(R) CPU E5620 @ 2.40GHz
Total Memory	98GB
Total Storage	4.6TB
Services	HTTP, WAF, SOS
Contact Name	Felimon Gayanilo
Contact Email	felimon.gayanilo@gcoos.org

3.3. Primary Application Server for GANDALF, iTAG and VAMPIRE

This is the primary server for the *Gulf AUV Network and Data Archiving Long-term Storage Facility* (GANDALF; http://gcoos2.tamu.edu/gandalf), *Integrated Tracking of Aquatic Animals in the Gulf of Mexico* (iTAG; http://gcoos2.tamu.edu/itag/), and *Visualization and Mapping Platform for Ichthyological Records Evaluation* (VAMPIRE; http://gcoos2.tamu.edu/vampire/) projects. The gcoos2 server is also serving as the near-site backup of gcoos1. The following is the technical specifications and configuration of gcoos2:

Server	gcoos2
Domain	tamu.edu
Alternate	128.194.26.146
Purpose	Primary web server of: • Gulf AUV Network and Data Archive Long-term storage Facility (GANDALF), • Integrated Tagging of Aquatic Animals in the Gulf of Mexico (iTAG), and • Visualization and Mapping Program For Ichthyologic Records Evaluation (VAMPIRE)
Physical location	Texas A&M University, College Station, TX
Operating System	CentOS 7.2
CPU	6 x 4GB Intel Xeon E5620 @2.40GHz
Total Memory	10GB
Total Storage	1.8TB
Services	HTTP, WMS
Contact Name	Robert Currier
Contact Email	bob.currier@gcoos.org

3.4. Primary GIS Server and WMS

This server (gcoos3.tamu.edu) is used to generate and serve map products and serves as the host for the ArcGIS services. The products are served via Concrete5 CMS and accessible via a desktop computer or mobile devices. The following is the technical specifications and configuration of gcoos3:

Server	gcoos3
Domain	tamu.edu
Alternate	165.91.85.7
Purpose	Primary server for creating and managing GIS Web services, applications, and data. It makes geographic information available to anyone with an Internet connection. All are available in WMS as well.
Physical location	Texas A&M University, College Station, TX
Operating System	CentOS 7.2
CPU	2 x 32GB Intel Xeon E5-2630 v3 @ 2.40GHz
Total Memory	64GB
Total Storage	1.2TB
Services	HTTP, WMS, WCS
Contact Name	Shinichi Kobara
Contact Email	shinichi.kobara@gcoos.org

3.5. ERDDAP AND TDS

This is GCOOS' *Environmental Research Division's Data Access Program* (ERDDAP) and Thematic Real-time Environmental Distributed Data Services (THREDDS) data server or TDS. The following is the technical specifications and configuration of gcoos4:

Server	gcoos4
Domain	tamu.edu
Alternate	165.91.85.11
Purpose	Server of ERDDAP and THREDDS
Physical location	Texas A&M University, College Station, TX
Operating System	CentOS 7.2
CPU	2 x 32GB Intel Xeon E5-2630 v3 @ 2.40GHz
Total Memory	64GB

Total Storage	1.2TB
Services	HTTP, OPeNDAP (ERDDAP & TDS)
Contact Name	Matthew Howard
Contact Email	mkhoward@tamu.edu

3.6. Droplet for Gulf Citizen Science portal

This the droplet installed in DigitalOcean facilities to serve the needs of Citizen Science projects (http://citizenscience.gcoos.org/). The following is the technical specifications and configuration of this droplet.

Server	GulfCitizenScience
Domain	gulfcitizenscience.org
Alternate	gcoos-products (DigitalOcean, 159.203.71.138)
Purpose	Primary server for citizen science data and web application.
Physical location	Droplet @ DigitalOcean, New York
Operating System	CentOS 7.2
CPU	4 x 2GB Intel Xeon E5-2650L v3 @ 1.80GHz
Total Memory	8GB
Total Storage	80GB
Services	HTTP, WMS
Contact Name	Robert Currrier
Contact Email	bob.currier@gcoos.org

3.7. Droplet for CASE/EJIP Model Data Viewer

This the droplet installed in DigitalOcean facilities to serve the needs of Climatology and Synthesis of Eddies/Eddies Joint Industry Project (CASE EJIP), an energy industry consortium. The following is the technical specifications and configuration of this droplet.

Server	gcoos-mdv
Domain	gcoos.org
Alternate	DigitalOcean 159.203.107.216
Purpose	Primary web server for CASE/EJIP Model Data Viewer
Physical location	Droplet @ DigitalOcean, New York
Operating System	CentOS 7.2
CPU	4 x Intel Xeon E5-2650L v3 @1.8GHz
Total Memory	8GB
Total Storage	80GB
Services	HTTP, WMS

Contact Name	Robert Currrier
Contact Email	bob.currier@gcoos.org

3.8. Server for HABscope project

This is the server to serve the needs of the Harmful Algal Bloom project (HABscope) effort of GCOOS and NASA. The following is the technical specifications and configuration of this droplet.

Server	habscope
Domain	gcoos.org
Alternate	DigitalOcean 162.243.168.92
Purpose	Primary web server for NASA ROSES HABscope project
Physical location	Droplet @ DigitalOcean, New York
Operating System	Ubuntu 16.04.01
CPU	2 x Intel Xeon E5-2650L v3 @1.8GHz
Total Memory	2GB
Total Storage	1x40GB SSD, 1x100GB SSD
Services	HTTP, WMS
Contact Name	Robert Currrier
Contact Email	bob.currier@gcoos.org

3.9. Droplet for Nutrient Data Portal

This droplet is designed to serve the nutrient and hypoxia-related data that were collected and collated from various sources in the Gulf of Mexico region The following is the technical specifications and configuration of this droplet.

Server	nutrients
Domain	gcoos.org
Alternate	DigitalOcean 45.55.63.95
Purpose	Primary web server for HAB-Nutrients Data Portal
Physical location	Droplet @ DigitalOcean, New York
Operating System	CentOS 7.2
CPU	4 x Intel Xeon E5-2650L v3 @1.8GHz
Total Memory	8GB
Total Storage	80GB
Services	HTTP
Contact Name	Felimon Gayanilo
Contact Email	felimon.gayanilo@gcoos.org

Data collections and distribution services are done largely via HTTP and FTP facility. To date, GCOOS is receiving data from the following data sources (see *Series 2. Data Transport and Procedures*):

- Dauphin Island Sea Laboratory (DISL),
- Texas Coastal Ocean Observation Network (TCOON),
- Mote Marine Laboratory (Mote),
- Coastal Ocean Monitoring and Prediction System (COMPS),
- Central Gulf Ocean Observing System (CenGOOS),
- Louisiana University Marine Consortium (LUMCON),
- Wave-Current-Surge Information System (WAVCIS),
- Texas Automated Buoy System (TABS),
- Sannibel-Captiva Conservation Foundation (SCCF-RECON),
- Center for Ocean-Atmospheric Prediction Studies (FSU/COAPS),
- Florida Fish and Wildlife Conservation Commission (FWRI),
- Everglades National Park (ENP),
- NOAA National Data Buoy Data Center (NDBC),
- NOAA National Ocean Services (NOS), and
- NOAA National Estuarine Reserve Research System (NERRS).

4. Data Flow and Acquisition

The *Gulf of Mexico Coastal Ocean Observing System* (GCOOS) does not own or manage physical observing assets. Local Data Nodes (LDN) contribute data voluntarily, and as such, GCOOS is receiving data from heterogeneous sources and data types. These data types can be classified into four different categories (Figure 4.1): MODEM/GTS, SOS, WSDL and HTTP/TXT (Table 42.2 and 4.3). GCOOS developed modules to parse the received that comes in many data formats. Constant monitoring is done to ensure that data flow from the LDN to the GCOOS remains uninterrupted. In cases where the data format is modified, LDNs notifies GCOOS to adjust the scripts accordingly.

Although it is assumed that LDNs follow stringent practices to ensure sensors are calibrated regularly, and data received from sensors are validated prior to data submittsion, GCOOS re-executes QA/QC test to all the data received to ensure uniformity of data quality. The HF Radar and glider data are managed directly by the HF Radar DAC (http://cordc.ucsd.edu/projects/mapping/maps/; see section 4.5 of this document) and Glider DAC (https://gliders.ioos.us; ; see section 4.6 of this document), respectively. GCOOS uses their APIs to read and display processed data.

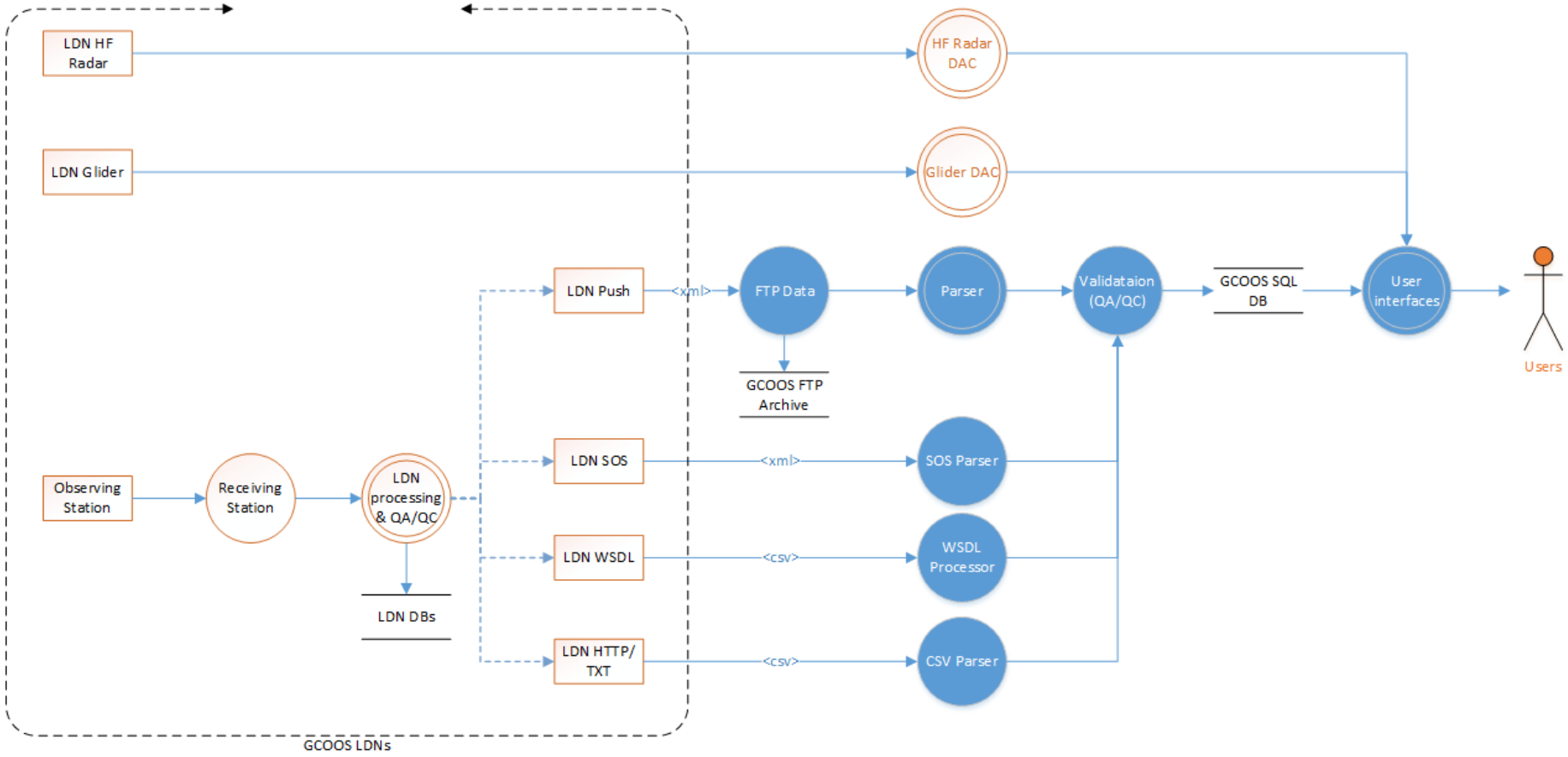

Figure 4.1. Data flow diagram that presents the data flow from data providers to the GCOOS Data Portal (see also Tables 4.2 and 4.3). Data from observing stations are processed before ingestion. GCOOS provides many interfaces to allow for easy extraction of data from its repository.

4.1. MODEM

Some non-federal providers push data to GCOOS in NDBC's "MODEM" format with GCOOS file naming conventions. This format presents a low-barrier to entry for new data providers. The data on the GCOOS FTP dropsite are pushed to the primary server for processing. After processing, the files are archived on another folder for backup purposes. The MODEM formatted data are not W3C DOM (*Document Object Model*) compliance (see below) hence cannot be read as a regular XML file. Data files are first corrected to be DOM compliance but adding an outside tag to generate a single root XML, and parsed to extract the data to be stored on the primary database.

The following is an example of such file from the Everglades National Park, FL:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
 <message>
  <station>BDVF1</station>
   <date>07/27/2012 17:00</date>
    <missing>-9999</missing>
     <met>
       <tp001>30.83</tp001>
       <wtmp1>30.83</wtmp1>
       <prec1>  0.0</prec1>
       <dp001>1.5</dp001>
       <fm64iii>830</fm64iii>
       <fm64xx>99</fm64xx>
       <fm64k1>7</fm64k1>
       <fm64k2>1</fm64k2>
       <sp001> 0.65</sp001>
       <tide1>12.8</tide1>
     </met>
 </message>
 <message>
  <station>BDVF1</station>
   <date>07/27/2012 17:06</date>
    <missing>-9999</missing>
     <met>
       <tide1>12.79</tide1>
     </met>
 </message>
 <message>
  <station>WWEF1</station>
   <date>07/27/2012 17:54</date>
    <missing>-9999</missing>
     <met>
       <tide1>10.35</tide1>
     </met>
 </message>
```

NOTE: Although this approach may be crude, this is the most reliable since it is not intrusive to the data providers and GCOOS on the other hand, can process or reprocess the data as required.

4.2. Sensor Observation Service (SOS)

The Sensor Observation Service (SOS) is the preferred data delivery mechanism, and Local Data Nodes (LDNs) are encouraged to implement OGC SOS facilities to serve their data files. A GET request is made every 30 minutes from LDNs with SOS installation. The data source returns an OGC SOS compliant data that is parsed and required data extracted, then saved onto the central database. The SOS *GetCapabilities* facility is usually used to determine the assets of a provider. However, since these assets remain constant, *GetCapabilities* is seldom used. The SOS *GetObservation* function is regularly used to get the most recent data.

```
An example of SOS commands to extract data:

GetCapabilities

http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&request=GetCapabilities&AcceptV
ersions=1.0.0
DescribeSensor (e.g. NERRS station apaebwq)

http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=1.0.0&request=DescribeS
ensor&procedure=urn:ioos:station:nerrs:apaebwq&outputFormat=text%2Fxml%3B%20subtype%3
D%22sensorML%2F1.0.1%2Fprofiles%2Fioos_sos%2F1.0%22
GetObservation (e.g. from station BSCA1 and for air temperature)

http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=1.0.0&request=GetObserv
ation&offering=urn:ioos:network:gcoos:all&observedProperty=http%3A%2F%2Fmmisw.org%2Fo
nt%2Fcf%2Fparameter%2Fair_temperature&procedure=urn:ioos:station:disl:bsca1&responseF
ormat=text%2Fxml%3B%20subtype%3D%22om%2F1.0.0%2Fprofiles%2Fioos_sos%2F1.0%22&eventtim
e=latest
```

NOTE: Although this is the preferred approach, most LDNs do not have the resources to install and manage the 52North SOS or ncSOS instances. Most of the LDNs are still using the now defunct, OOSTethys version of the SOS.

4.3 WSDL

The *Web Services Description Language* (WSDL) is supported by GCOOS to extract data from the *National Estuarine Research Reserve System* (NERRS) information system. The *Centralized Data Management Office* (CDMO) of NERRS has created several web services products to facilitate the extraction of real-time data from their databases.

```
Example of a PHP command to extract the latest single point data from station
_wkbmbwq_

$wsdl=new nusoap_client('http://cdmo.baruch.sc.edu/webservices2/requests.cfc?wsdl');
$wsdl->call('exportSingleParamXMLNew',array('tbl'=>'wkbmbwq','numrecs'=>'1',
'param'=>'Temp,Sal,DO_mgl,Turb,Depth'));
```

4.4 HTTP/TXT

GCOOS also allows LDNs to post data in TXT forms as an option in data extraction if all other options fail. This approach is discouraged due to the heterogeneity of the files. Individual modules need to be developed to extract data from TXT files given that no encoding standard can be imposed.

```
The following is an example of such output from TABS R Station:

7/28/2015 04:00:00    13.14   21.59   25.27    31.3    30.9
07/28/2015 04:30:00    15.91   19.67   25.30    39.0    30.8
07/28/2015 05:00:00    13.45   18.88   23.18    35.5    30.8
07/28/2015 05:30:00    15.91   15.73   22.37    45.3    30.7
07/28/2015 06:00:00    14.74   14.00   20.33    46.5    30.7
07/28/2015 06:30:00    15.91   12.36   20.15    52.2    30.6
07/28/2015 07:00:00    14.35    9.61   17.27    56.2    30.6
07/28/2015 07:30:00    15.48    6.79   16.90    66.3    30.5
07/28/2015 08:00:00    15.62    3.50   16.01    77.4    30.5
07/28/2015 08:30:00    19.10   -1.69   19.17    95.1    30.4
07/28/2015 09:00:00    19.46   -0.99   19.49    92.9    30.4
07/28/2015 09:30:00    19.21   -3.33   19.50    99.8    30.4
07/28/2015 10:00:00    18.78   -4.98   19.43   104.9    30.3
```

4.5. HF Radar

All HF radar data go directly to the HF Radar Data Acquisition Center (DAC; http://hfrnet.ucsd.edu/thredds/catalog.html) which collates and QA/QC the data ingested. GCOOS Data Portal uses the published API to retrieve processed data. Table 4.1. is a list of the radar stations in the Gulf of Mexico from the Local Data Nodes.

Table 4.1. HF data sources in the Gulf of Mexico.

Network	*Stations*	*Latitude*	*Longitude*	*Frequency*
University of Southern Mississippi (USM)	SGRV (Singing River, MS)	30.3339	-88.5686	4.7500 MHz
	HBSP (Henderson Beach Station State Park, FL)	30.3830	-86.43	4.543 MHz
	OBSP (Orange Beach State Park, AL)	30.2494	-87.6685	4.580 MHz
University of South Florida	FDS (Ft. De Soto, FL)	27.6358	-82.7381	12.642 MHz
	NAPL (Naples. FL)	26.1622	-81.8105	4.900 MHz
	RDSR (Reddington, FL)	27.8325	-82.8344	4.900 MHz
	VEN (Venice, FL)	27.0756	-82.4511	12.646 MHz
	VENI (Venice, FL)	27.0776	-82.4516	4.900 MHZ
Texas A&M	PINS (Padre Island, TX)	27.4216	-97.300	4.505 MHz
	RLVR (Rollover Pass ,TX)	29.5079	-94.4989	4.450 MHz
	SSDE (Surfside, TX)	29.0077	-95.2155	4.450 MHz

4.6 Glider Data

GCOOS offers several services free of charge to any glider operator who is interested in such services. These services include posting trajectories, plots and datasets on the GANDALF website http://gcoos2.tamu.edu/gandalf/deployed and posting data to the IOOS National Glider DAC (NGDAC) which makes them: available to the public through IOOS ERDDAP/TDS servers, available via the Global Telecommunications System (GTS) and archived by the National Centers for Environmental Information (NCEI).

ERDDAP: https://data.ioos.us/gliders/erddap/info/index.html

TDS: https://data.ioos.us/gliders/thredds/catalog.html

Glider data take several forms. To reduce power consumption and telecommunication costs, near real-time data are sparse versions (~5%) of the full-resolution datasets. Delayed-mode full-resolution datasets are downloaded from the gliders after they have been recovered. Near real-time or delayed-mode data to be submitted to the NGDAC must be reformatted into individual vertical profiles following the NGDAC NetCDF File Format V2.0 conventions. This produces vertical profiles approximating those typically collected from a ship but positioned at the center of a glider's dive or climb. Alternatively, the full 3-D trajectory of the glider can be preserved by reformatting the data in compliance with NCEI's NetCDF trajectoryProfile V2.0. At present the NGDAC is primarily concerned with passing data to the GTS which is only interested in temperature, salinity and density. Other parameters, such as optical parameters can be included but they are not passed to the GTS. GCOOS only passes temperature, salinity and density to the GDAC, consequently NCEI is only archiving temperature, salinity and density (see https://github.com/ioos/ioosngdac/wiki/NGDAC-NetCDF-File-Format-Version-2 , and https://www.nodc.noaa.gov/data/formats/netcdf/v2.0/)

So far, GCOOS has only processed near real-time data. The data provider contacts GCOOS and opens access to the data. GCOOS assembles programmatic metadata from the data provider and registers the deployment with the NGDAC. Every few hours, GCOOS pulls the data from the provider, transforms the data into engineering units, reformats the data and submits it to the NGDAC. When the deployment is complete GCOOS closes the deployment at the NGDAC. Once closed, NCEI will archive the trajectory and issue an acquisition number to GCOOS who relays it back to the data provider. Data can usually be obtained from the GANDALF website.

A number of providers have asked GCOOS to prepare the full-resolution data including all scientific parameters for submission to NCEI. We have started to develop the software to do this. We anticipate submitting 3D trajectory data to NCEI mid-2017. Where applicable GCOOS will apply the QARTOD recommendations to both near real-time and delayed mode data prior to submitting it to NCEI. With permission from the

data providers, GCOOS will host delayed-mode glider data on their Data Portal and ERDAP/TDS servers.

4.7 Station-based Data Sources

The following are tables (Table 4.2 and Table 4.3) summarizing the type of data that GCOOS is handling from data sources.

Table 4.2. Data types from non-federal data sources.

Local Data Node	MODEM/GTS	DIF/52N/nc/ OOSTethys SOS	OGC WSDL	XML/CSV
Dauphin Island Sea Laboratory (DISL)	-	yes	-	-
Texas Coastal Ocean Observation Network (TCOON)	-	yes	-	-
Coastal Ocean Monitoring and Prediction System (COMPS)	-	yes	-	-
Central Gulf Ocean Observing System (CenGOOS)	yes	-	-	-
Louisiana University Marine Consortium (LUMCON)	-	-	-	yes
Wave-Current-Surge Information System (WAVCIS)	-	yes	-	-
Texas Automated Buoy System (TABS)	-	yes	-	yes
Sanibel-Captiva Conservation Foundation (SCCF RECON)	-	yes	-	-
Center for Ocean-Atmospheric Prediction Studies (FSU/COAPS)	-	-	-	yes

Local Data Node	MODEM/GTS	DIF/52N/nc/ OOSTethys SOS	OGC WSDL	XML/CSV
Florida Fish and Wildlife Conservation Commission (FWRI)	-	yes	-	-
Everglades National Park (ENP)	yes	-	-	-

Table 4.3. Data types from federal data sources.

Federal Sources	MODEM/GTS	DIF/52N/nc/ OOSTethys SOS	OGC WSDL	XML/CSV
National Estuarine Research Reserve System (NERRS)	-	-	yes	-
National Ocean Service (NOS)	-	yes	-	yes
National Data Buoy Data Center (NDBC)	-	yes	-	yes

5. Data QA/QC

GCOOS staff strive to ensure GCOOS only serves valid data of known quality. This can only be achieved through the application of good data stewardship practices throughout the data life cycle. Good data stewardship practices include the adoption and application of a Quality Assurance (QA) and Quality Control (QC) Plan. In brief, QA consists of actions taken before data collection begins to assure the data have the best chance of being valid and free of defects; QC consists of actions taken after the data have been collected to identify and mitigate flaws.

Good QA practice begins by choosing the appropriate sensor and instrument for the operating environment and the parameter to be measured and by selecting a deployment location and platform site which are free of structures and other obstructions which might interfere with or bias the measurements. Upon deployment and at each service visit the operator should verify and document that: the instrument settings are correctly set to achieve the desired sampling rates and behaviors (e.g., periodic burst sampling), the range of values expected to be encountered will be recorded with the desired numerical resolution, the most recent calibration factors are applied, the sensors are clean and functioning properly and the telecommunications system and power supplies are operating nominally. QC actions include: checking that data were recorded at the expected frequency and transmitted at the expected times, verifying that the data values have reasonable magnitudes and the expected variability, documenting which QC tests were made, assigning flag values to indicate the results of those test, inserting placeholders for missing values and, if desired, editing the data to repair defects or correct for sensor drift.

Documentation is vital to the production of quality data. Information that should be recorded includes: which sensors and instruments were used, where and when they were deployed, when and what maintenance was performed and what was the sensor condition at servicing and just prior to recalibration. Observing system operators typically produce and maintain log books, inventory lists and shipping logs to record and preserve this information.

5.1. Classification of data type based on delivery time

Real-time data are data which are available for use at the time the measurement was made, e.g., a vehicle speedometer. Some environmental sampling systems using cabled instruments or other continuous data telemetry methods to deliver data in real-time. The bulk of the data received by GCOOS are "near" real-time data. Near real-time data are data received some time after the measurement was made. The amount of time between the measurement and delivery to the shore side data systems ranges from seconds to one or more multiples of the sampling rate. For example, once each hour NDBC reports values that were measured sometime during the previous hour. GCOOS pulls data from NDBC each hour. The delay between when the measurement was made and when it becomes available through GCOOS servers depends on when the measurement was made, when NDBC posts the data and when GCOOS pulls the data, but typically this delay is less than two hours. As another example, autonomous profiling gliders collect data every few seconds but only transmit data to shore when they are at the surface which is typically about every 6 hours. GCOOS checks for new data every 6 hours so consequently, data can be up to 12 hours old when they first become available to the public. Real-time and near real-time data are useful in defining the current environmental conditions and are especially valuable for forecasting, search and rescue and response to environmental events (e.g., oil-spills). Delayed-mode data are data which first become available days, months or even years after collection. Examples are internally-recorded data from a moored instruments or the full-resolution data downloaded from an autonomous glider after recovery. Historical data are data that were collected years to decades ago. Delayed-mode and historical data are valuable for retrospective analyses and useful for the formation of long-term averages and climatologies.

5.2. Quality Assurance

GCOOS aggregates data from Federal and non-Federal ocean observing systems. Most of these systems were established and designed to satisfy their sponsor's mission requirements and put into operations long before GCOOS-RA came into existence so GCOOS-RA had no influence on the QA aspects of sensor selection,

platform site selection, and instrument settings. However, with the exception (by definition) of Citizen Scientist operations, we are confident that the non-federal and Federal providers employ professional scientists and engineers to design, deploy, document and maintain their observing systems. Because GCOOS-RA provides supplemental funding to most of the regional non-Federal data providers, GCOOS-RA has, or will soon have, contractual requirements with each of them requiring that they maintain their systems according to best data stewardship practices and to provide documentation to this effect upon demand.

5.3. Quality Control for Selected Near Real-time Data Streams

Although GCOOS-RA has limited influence over the selection, siting and maintenance of equipment, GCOOS has full control over the QC applied to all data aggregated and served though the GCOOS Data Portal. The list of non-Federal near real-time data streams currently aggregated by GCOOS is given in Table 2.1 and online at http://data.gcoos.org/ldn_list.php. The list of Federal stations is given in Table 2.2 and online at http://data.gcoos.org/fed_list.php

With some exceptions, GCOOS plans, by the end of 2017, to apply the QC guidance found in the U.S. IOOS Program Office's Quality Assurance of Real Time Oceanographic Data (QARTOD) manuals and will generate data flags using the flag definitions and encoding schema given in the Manual for Real-Time Oceanographic Data Quality Control Flags to the near real-time data served through the GCOOS Data Portal. The exceptions include: data collected by Citizen Scientists, numerical model output, satellite products, HF-Radar data, glider data, wave data collected by SCRIPPS CDIP group and Federal data.

Citizen Scientist data will not be served through the SOS or ERDDAP services of the Data Portal. Citizen Scientist data are served through separate Citizen Scientist pages organized, with disclaimers, under the Products Portal. Model output from atmospheric or oceanic hindcasts/forecasts will not be subjected to QC but will be accompanied by disclaimers. Satellite data are not held by GCOOS; we rely on our satellite data providers to process and reprocess their level 2, 3 and 4 data in accordance with contemporary best practices and algorithms. HF-Radar QA/QC is

handled by the HF-Radar DAC which is GCOOS' source of these data. The IOOS National Glider DAC (NGDAC) will apply appropriate QC to glider data if and only if the QC flag attributes are omitted from the NetCDF files submitted to them. GCOOS currently has glider QA/QC performed by the NGDAC. All *in situ* surface gravity wave data collected in the U.S. Gulf of Mexico are collected by the SCRIPPS CDIP group or NDBC. The CDIP group is a recognized authority on wave data, and we accept their QA/QC as high-quality and sufficient. Federal data are subjected to Federal QA/QC procedures (which are the basis of some of the QARTOD manuals). Federal QA/QC procedures are accepted as high-quality and sufficient.

Table 5.1 lists the near real-time parameters currently aggregated and served by the GCOOS Data Portal. GCOOS plans to have the QARTOD guidance applied on a continuous basis to our near real-time data streams by the end of 2017; at a minimum GCOOS will apply the “Required” and “Strongly-Recommended” tests found in the applicable QARTOD manuals. Currently, the GCOOS QC system consists of the first few of the required QARTOD tests and quality control flags are generated only for the gross range checks. We perform the QARTOD required checks for timing/gap test, syntax test, and gross range tests. Timing/gap tests include checks for valid timestamps and checks that data arrive when expected. Syntax tests check that the message blocks containing the data and the data themselves conform to the schema and are readable. Gross range checks compare observed data to estimates of the maximum or minimum likely values for a given parameter. Currently, our gross range checks use single value Gulf-wide range limits; we have not implemented the climatology test which takes seasonal and geographic variability into account. Except for gliders and mobile drilling platforms, the observation platforms locations are fixed and the required "location" tests are not made for fixed sites. The range limit values used for the gross limit checks are listed in table 5.1. These limits were based on analyses of multi-decadal regional datasets, listed world extremes (atmospheric pressure) or inherent limits (pH, wind/current/wave direction, humidity). GCOOS is considering options for developing seasonal location-based range limits for the climatology tests. These ranges may be computed from near real-time data in our database or taken from gridded climatological data developed by NCEI (e.g., Gulf of Mexico Climatology) or Navy (e.g., GDEM-3) or NOAA. Our present quality control

flags indicate the quality states of: 1 = good, 2 = untested, 3 = suspect and 4 = bad and 9 = missing value. At present these flags are not available through the SOS service as there is no built-in mechanism to report them together with the SOS response for a requested parameter although they can be stored and served the same way as parameters are but then the parameter and associated flag values would have to be requested separately. We could modify the SOS to handle two channels of data much like speed and direction are handled now. We are reluctant to modify the SOS in case it is updated which likely would break any modifications we might make. Flag values can be accommodated in NetCDF files and served through ERDDAP/TDS services, and this is our current plan.

The IOOS QARTOD page https://ioos.noaa.gov/project/qartod/ contains QA/QC manuals for a variety of parameters and information about the QARTOD project. The manuals contain simple pseudo-code for the QA/QC tests. GCOOS staff may develop their own codes but are equally likely to use python codes developed under IOOS funding for community use found at https://github.com/asascience-open/QARTOD.

Table 5.1. Acceptable range of values by parameter based on regional datasets, global extremes or inherent limits (e.g., pH, wind/current/wave direction or relative humidity).

Parameter	Acceptable Range	References
water temperature	-10 – 40 C	qartod_temperature_salinity_manual.pdf
air temperature	-10 – 50 C	USGS Field Manual (6.1 Temperature)
dew point	-10 – 50 C	USGS Field Manual (6.1 Temperature)
relative humidity	0 – 100%	To be determined
significant wave height	0 – 10 m	qartod_wave_data_manual.pdf
wave period	0 – 15 sec	qartod_wave_data_manual.pdf
wind direction	0 – 359 deg N	qartod_wind_manual.pdf
wind speed	0 – 75 m/sec	qartod_wind_manual.pdf
wind gust	0 – 75 m/sec	qartod_wind_manual.pdf
barometric pressure	870 – 1085 mbar	To be determined
salinity	0 – 50 PSU	qartod_temperature_salinity_manual.pdf
turbidity	0 – 1000 NTU	USGS Field Manual (6.7. Turbidity)
pH	0 – 14	USGS Field Manual (6.4. pH)
dissolved oxygen	0 – 15 mg/L	qartod_dissolved_oxygen_manual.pdf

phytoplankton concentration	0 – 1500 cells/L	PhytoplanktonManual_v1.0.pdf
water level	0 – 10 m	qartod_water_level_manual.pdf
current speed	0 – 180 cm/s	qartod_currents_manual.pdf
current direction	0 – 359 deg N	qartod_currents_manual.pdf
chlorophyll	0 – 50 mg/L	QARTODOceanOptics_v1.1_Final.pdf
fish abundance	TBD	To be determined

Table 5.2. QA/QC flags used for GCOOS data.

Flag Value	Meaning	Comment
1	Good	Data passed test
2	Untested	Data not tested or evaluated
3	Suspect	Measurement is questionable
4	Bad	Data failed test
9	Missing data	Data absent

5.4. Quality Control for Selected Historical Data

GCOOS has access to significant amounts of delayed-mode and historical data from various sources. This includes moored current meter data, CTD casts, biogeochemical data, delayed-mode autonomous glider data, fisheries and plankton data. GCOOS has slowly been migrating these datasets into NCEI NetCDF formats and serving them through the GCOOS ERDDAP server. Based on first-hand knowledge we know some of these datasets have had significant QA/QC applied to them while others have had little or no QA/QC applied. Until we can document the processing for those datasets that have had QA/QC applied or conduct community sanctioned QA/QC processing to these data that have not had QA/QC applied we intend to migrate them off GCOOS ERDDAP server onto an unaffiliated server and point to them. A server for this purpose is currently being developed under other funding (Texas OneGulf Center of Excellence -Texas Knowledge Base Program). This server is currently located at http://tkb.geos.tamu.edu:8080/erddap/index.html.

6. Data Access and Distribution

The *Gulf of Mexico Coastal Ocean Observing System* (GCOOS) Data Portal provides three means to extract data from its portal: (1) Direct Access, (2) 52North SOS, and (3) Web Accessible Folder (WAF).

6.1. Statement on Data Sharing

GCOOS will adhere to the directives for sharing environmental data and peer-reviewed publications expressed in version 3.0 of the NOAA document Data and Publication Sharing Directive for NOAA Grants, Cooperative Agreements and Contracts and will adhere with guidance, definitions, directives and requirements contained therein. In particular, with respect to near real-time environmental data, we will make such data and metadata available as soon as practical after the observation has been received by shore-side data systems. In most cases this will be under 1 hour for regularly reporting observations, somewhat longer (e.g. 4 hours) for irregularly reporting systems such as gliders. All data served by GCOOS will be made independently understandable, visible and accessible to the public without restriction and at no cost to the end user or no more than the cost of reproduction.

Sharing Directive: https://nosc.noaa.gov/EDMC/documents/Data_Sharing_Directive_v3.0.pdf

6.2. Direct Data Access

Direct Access had been the preferred option in extracting data from repositories. Although the introduction of other options are becoming popular, Direct Access via a RESTfull approach remains popular to some sector of the community as it returns Comma Separated Values (CSV) the most common data format in the community.

6.2.1. Data Call Instructions to get Headers

The following is a direct call syntax to get headers for GCOOS assets:

Syntax

http://data.gcoos.org/get_gcoos_assets.php?source={1}&extension={2};

where

{1} optional: can either be a blank (default) to get all assets, 'federal' to get only federal assets or'non-federal' to list only non-federal assets.

{2} optional: default is *'false'* and can be equal to '*true*' to get additional platform information such URN, URL, URL for RSS feed, image and short text label of the platform.

Example:

To get all assets:

http://data.gcoos.org/get_gcoos_assets.php

To get all federal assets:

http://data.gcoos.org/get_gcoos_assets.php?source=federal

To get all non-federal assets:

http://data.gcoos.org/get_gcoos_assets.php?source=non-federal

To get all non-federal assets with additional platform data:

http://data.gcoos.org/get_gcoos_assets.php?source=non-federal&extension=true

6.2.2. Data Call Instructions to get Observation

The following is the syntax for direct data retrieval from GCOOS repository.

Syntax:

http://data.gcoos.org/get_gcoos_data.php?bbox={1}&start={2}&stop={3}&obs={4}&source={5}&fmt={6}&sortBy={7}&qc={8}

where:

{1} westlon,southlat,eastlon,northlat, where:

westlon = longitude of western edge of bounding box expressed as a floating point number

southlat = latitude of southern edge of bounding box expressed as a floating point number

eastlon = longitude of eastern edge of bounding box expressed as a floating point number

northlat = latitude of northern edge of bounding box expressed as a floating point number

{2} start date formatted as YYYY-MM-DDTHH:MM:SSZ

{3} stop date formatted as YYYY-MM-DDTHH:MM:SSZ

{4} observation to retrieve

air_pressure: for barometric readings
air_temperature: for air temperature readings
chlorophyll: for chlorophyll readings
current: for the ocean current data (speed, direction, meridional and zonal velocities)
do: for disolved oxygen and concentrations
relHumidity: relative humidity readings
salinity: for salintity measurements
turbidity: turbidity measurements
water_level: water level measurements
water_temperature: for water temperature data
waves: wave readings
winds: for winds (speed, direction and gust)

{5} data source which may either be: All, ADCP, COAPS, COMPS, CenGOOS, DISL, ENP, FWRI, LUMCON, NDBC, NERRS, NOS, SCCF RECON, TABS, TCOON, WAVCIS, SCRIPPS

{6} desired output format. Only CSV is currently supported.

{7} ascending sort order:

dates: sort the output by dates; provider: sort the ouput by data provider, then dates; or station: sort the output by the name of the station.

{8} QC flag: [NOTE: This feature is currently disabled until further notice.]

yes: QC flags will be exported with each data (1: good or pass; 2: not evaluated, not available or unknown; 3: questionable; 4: bad or failed; 9: missing data) no: this is the default and no QC flag will be exported

Example:

To access the water temperature data in the repository for all the Gulf region for the period November 01, 2008 (time: 00:00:00 UTC) to November 15, 2008 (23:59:59 UTC) and sorted by dates, the call should be:

http://data.gcoos.org/get_gcoos_data.php?bbox=-98.4,21.7,-80.5,31.0&start=2008-11-01T00:00:00Z&stop=2008-11-15T23:59:59Z&obs=water_temperature&source=All&fmt=csv&sortBy=dates&qc=yes

6.2.3. User Interactive Form

The Direct Access website (http://data.gcoos.org/directAccess.php) provides an interactive user interface (Figure 6.1) to define the coordinates or geographical space of interest, temporal coverage, specific observation, data source and output format. The inputs from this form will generate the proper syntax to extract the required data.

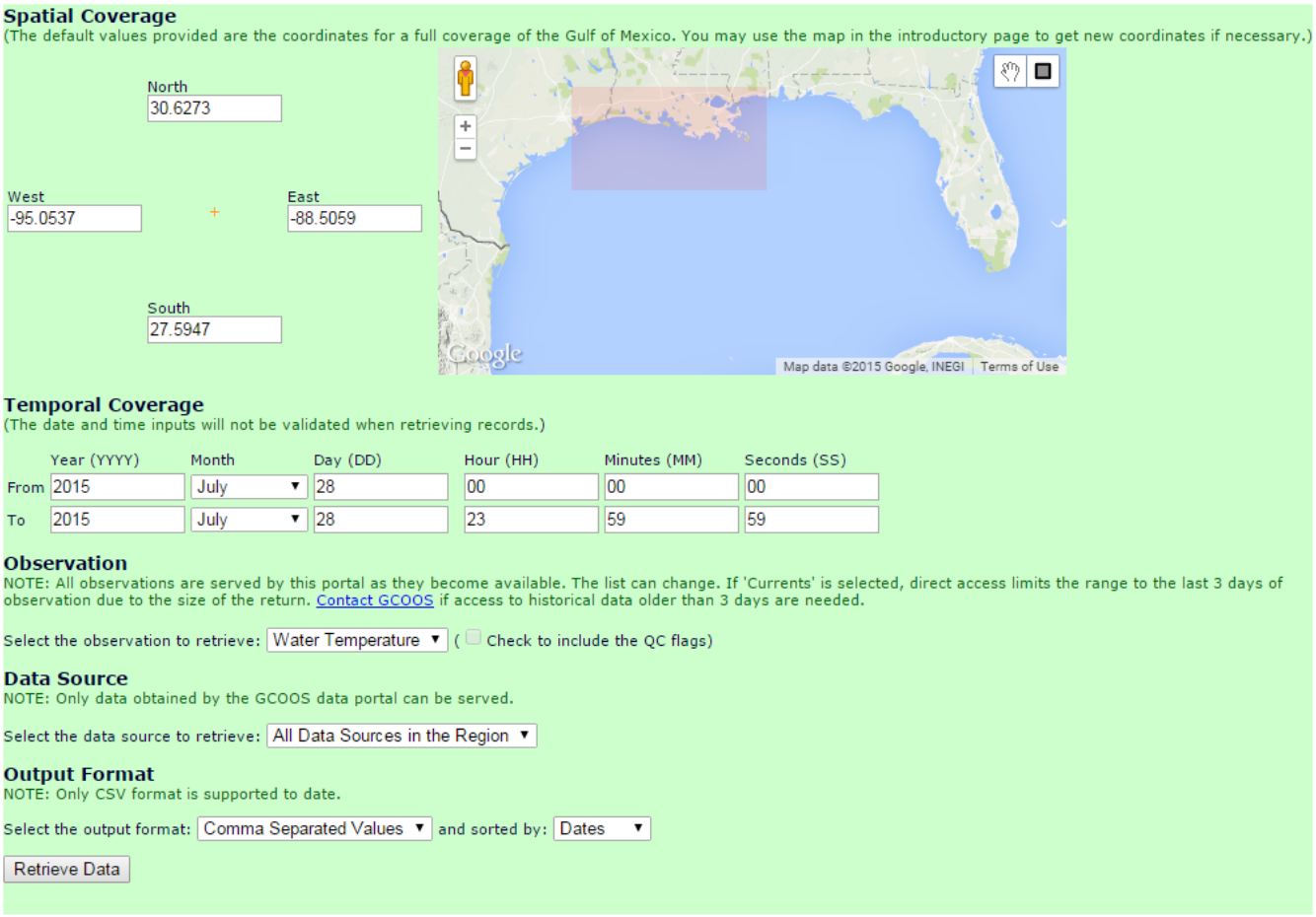

Figure 6.1. User interactive interface in GCOOS Data Portal to assist in the construction of the syntax.

NOTE: To date, only the Comma Separated Value (CSV) output format is supported.

6.3. OGC SOS Facility

The *Open Geospatial Consortium* (OGC; http://www.opengeospatial.org/) *Sensor Observation Services* (SOS; http://www.opengeospatial.org/standards/sos) is a data exchange standard that defines web service interface to an information system to extract data. GCOOS installed the IOOS customized build of the *52North SOS* version (http://ioos.github.io/i52n-sos/) on two different servers to serve as a backup to the service points.

The GCOOS SOS installation (http://data.gcoos.org:8080/52nSOS/) is continually updated as the need arise (see below for relevant links) to keep abreast with technology and patches. Although it allows for various types of data request, bindings and operations, the three primary data request types are: *GetCapabilities*, *DescribeSensor*and *GetObservation*. The service endpoint also supports *GetFeatureofInterest* and *GetObservationById*.

6.3.1. GetCapabilities

This request returns the service metadata. Due to high number of sensors that GCOOS is serving, it can take around 10 seconds to return results from a *GetCapabilities* request.

```
Purpose:     Returns a metadata for this service
Parameters:  request = GetCapabilities
             service = SOS
             version = 1.0.0 || 2.0.0
Example:

             http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&request=GetCapabil
             ities&AcceptVersions=1.0.0

Details:     https://wiki.52north.org/bin/view/SensorWeb/GetCapabilities
```

6.3.2. DescribeSensor

Unlike the *GetCapabilities*, this request type (i.e. *DescribeSensor*) extracts only the details about the platform and associated sensors. This is used largely to plot the stations since it returns data faster than *GetCapabilities*.

```
Purpose:    Return sensor characteristics
Parameters: request = DescribeSensor
            outputFormat = text/xml;subtype="sensorML/1.0.0/profiles/ioos_sos/1.0"
            procedure = URN of sensor system (see GetCapabilities output for
            sensor's URN)
            service = SOS
            version = 1.0.0 {this is in reference to sensorML ver. 1.0.0}

Example:

            http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=1.0.0&requ
            est=DescribeSensor&procedure=urn:ioos:station:nerrs:apaebwq&outputFormat
            =text/xml; subtype="sensorML/1.0.1/profiles/ioos_sos/1.0"

Details:    https://wiki.52north.org/bin/view/SensorWeb/DescribeSensor
```

6.3.3. GetObservation

This operation allows the extraction of data according to OGC Observation and Measurement specifications. Although the following presents an example that returns an XML-formated results, the system can also return results formatted in netCDF.

```
Purpose:    Returns observation data for a sensor on a station within a user-defined
            time frame
Parameters: request = GetObservation
            service = SOS
            version = 1.0.0
            offering = URI advertized (see getCapabilities output for offerings; e.g.
            urn:ioos:network:gcoos:all)
            observedproperty={comma separated URIs; see GetCapabilities}
            procedure={URIs for procedures; see GetCapabilities}
            responseformat=text/xml; subtype="om/1.0.0/profiles/ioos_sos/1.0" ||
            application/json || {MIME content type}
            {optional} eventtime=(latest||DateTime || DateTime1/DateTime2)

Example:    To get the latest data:
```

```
            http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=1.0.0&requ
            est=GetObservation&offering=urn:ioos:network:gcoos:all&observedProperty=
            http://mmisw.org/ont/cf/parameter/air_temperature&procedure=urn:ioos:sta
            tion:disl:bsca1&responseFormat=text/xml;
            subtype="om/1.0.0/profiles/ioos_sos/1.0"&eventtime=latest

            To get data for a time period (WARNING! Unlike getting the latest data,
            extracting data for a period can take time (average is 4 minutes):

            http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=1.0.0&requ
            est=GetObservation&offering=urn:ioos:network:gcoos:all&observedProperty=
            http://mmisw.org/ont/cf/parameter/air_temperature&procedure=urn:ioos:sta
            tion:disl:bsca1&responseFormat=text/xml;
            subtype="om/1.0.0/profiles/ioos_sos/1.0"&eventtime=2014-03-
            15T00:00:00/2014-03-15T12:00:00

            To get a response in JSON (NOTE: Only version 2.0 supports JSON response
            format and works only for XML POST. Also, this call can take about a
            minute to return couple of months of results) as eventtime is not
            supported:

            http://data.gcoos.org:8080/52nSOS/sos/kvp?service=SOS&version=2.0.0&requ
            est=GetObservation&offering=urn:ioos:network:gcoos:all&observedProperty=
            http://mmisw.org/ont/cf/parameter/air_temperature&procedure=urn:ioos:sta
            tion:disl:bsca1&responseFormat=application/json

Details:    https://wiki.52north.org/bin/view/SensorWeb/GetObservation for more on
            this request type.
```

NOTE: It is important to read through the documentation to get the most out of *GetObservation* request type.

6.4 ERDDAP/TDS

GCOOS in the process of making their: near real-time data, historical archives of near real-time data and historical collections of: data from oceanographic field campaigns, past reanalysis programs and ancillary GCOOS programs available on their *Environmental Research Division Data Access Protocol* (ERDDAP) and *Thematic Real-Time Environmental Distributed Data Services* (THREDDS) *Data Servers* (TDS). This will take some time to accomplish. GCOOS SOS service only serves data received in near realtime from regularly operating stations. Data available on the SOS are listed on the monitoring pages. The ERDDAP/TDS server has a list of its contents which currently includes: historical CTD data from the LATEX field program and the *Deepwater Reanalysis* programs, and independent fishery data from the CAGES, Reef Visual Census and Florida Keys Coral Reef Monitoring Project among others. The historical archives of near real-time data are in NetCDF files in our WAF directory. These can easily be served from our ERDDAP/TDS service.

ERDDAP/TDS Datasets: http://gcoos4.tamu.edu:8080/erddap/info/index.html

6.5. Web Accessible Folder (WAF)

In addition to *Direct Access* and *SOS* endpoints to access data from GCOOS Data Portal, GCOOS also maintains a *Web Accessible Folder* (WAF) to further promote data reuse. Files are summarized by observation on a monthly basis, as well as by platform or station. In addition of standard *Comma Separated Files* (CSV), monthly station data presented in netCDF data format is also available. To support growing number of catalogs, the GCOOS WAF also contain a folder with *SensorML2* files for all the stations it has in its inventory.

The folders also contain a SHA384SUM that contains the SHA-384 (*Secure Hash Algorithm*) cryptographic hash function results. The SHA384SUM file can be used by clients to validate the data downloaded from the GCOOS WAF. Figure 6.2. is a schematic representaion of the GCOOS WAF.

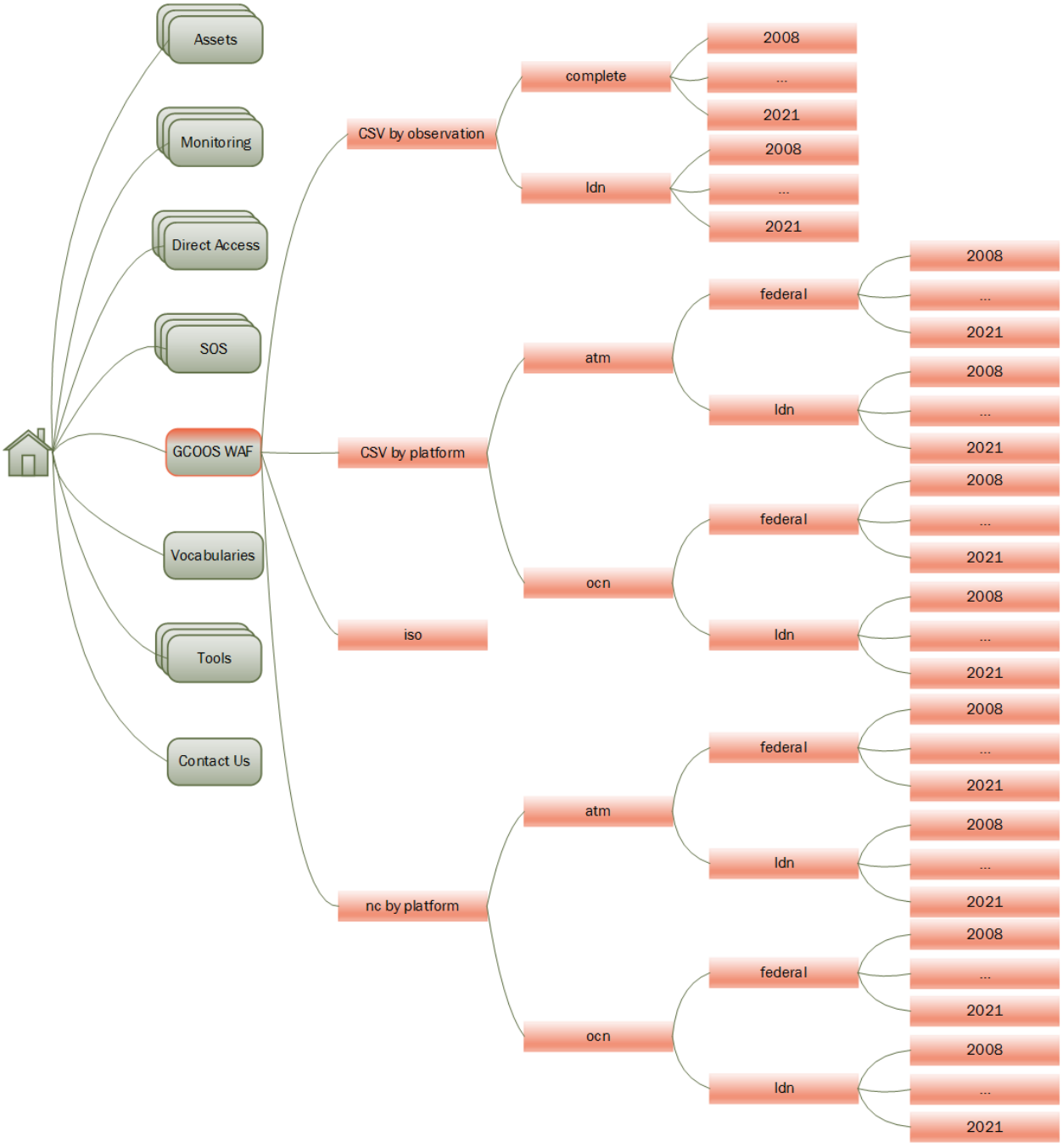

Figure 6.2. Schematic diagram of the GCOOS WAF folder structure.

The CSV files on the GCOOS WAF are generate monthly but the netCDF files that are used by *NOAA Centers for Environmental Information* (NCEI), are generated quarterly or as requested (Figure 6.3).

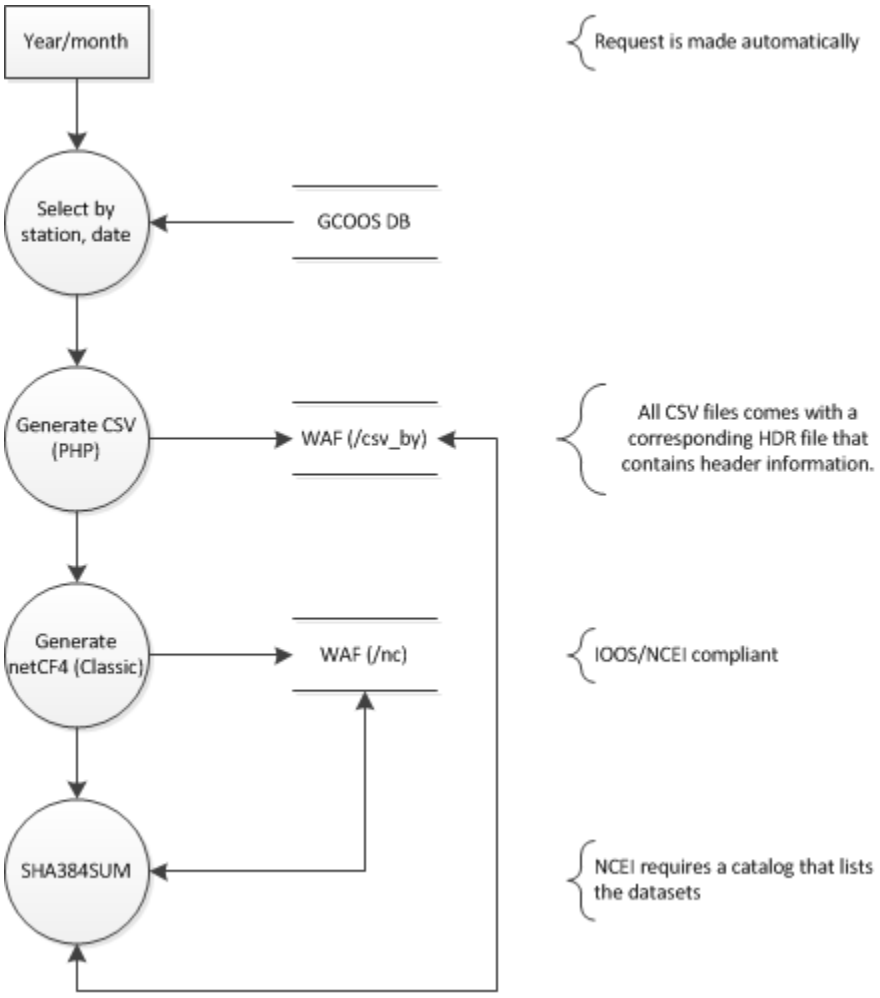

Figure 6.3. Data fFlow Diagram (DFD) in the generation of the files in the WAF.

The script to convert CSV files as generated from the GCOOS WAF (*http://data.gcoos.org/data/waf*) to a netCDF4 (Classic) in compliance to IOOS standard based on the NCEI recommendations at *https://sites.google.com/a/noaa.gov/ncei-ioos-archive/cookbook?pli=1#TOC-Providing-Data-Integrity* and in compliance with the *NODC Profile Orthogonal* specification at *http://www.nodc.noaa.gov/data/formats/netcdf/v1.1/profileOrthogonal.cdl*, are made available in *https://github.com/GCOOS/csv2nc*. The python codes published was designed for others who are also in the process of translating their data to comply with IOOS and NCEI requirements can use and follow the published codes.

7. Data Backup/Restore Strategy

The *Gulf of Mexico Coastal Ocean Observing System* (GCOOS) *Data Portal* maintains several levels of backup system to ensure high availability and fast recovery in cases of disaster. Figure 1 is a schematic diagram of the various level of backup-restore functions.

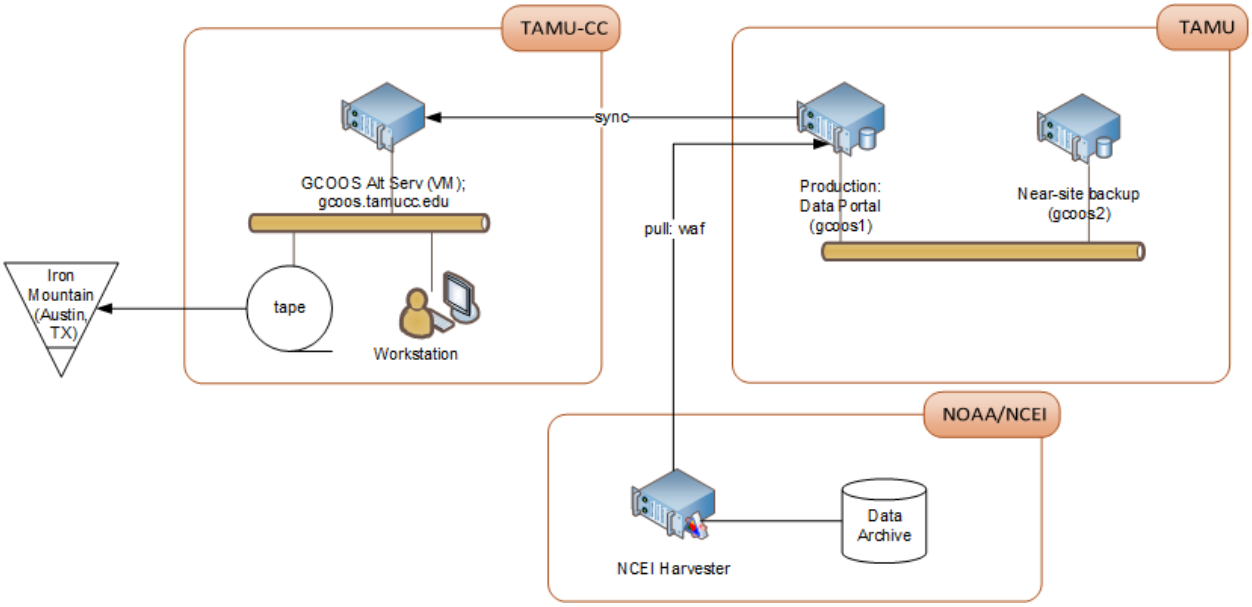

Figure 7.1. Schematic diagram of GCOOS backup system and restore points.

7.1. Level 1: Near-site Backup and Restore Point

Daily, monthly and annual backup of the primary database is made to *gcoos2* server that resides within the same network and physical location as that of *gcoos1* (primary data portal server).

7.2. Level 2: Off-Site Backup and Alternate Server

Daily synchronization (*CentOS RSYNC* and *postgreSQL Streaming Replication*) is made to GCOOS alternate server (*gcoos.tamucc.edu*) based in Corpus Christi, TX from the gcoos1 server in College Station, TX. This facility is also engaged if communication to the primary server is severed for whatever reason, or if the server needs to undergo maintenance. The domain, managed by *hover.com*, will roll-over to the alternate server, *gcoos.tamucc.edu* that ensures high-availability of GCOOS services.

7.3. Level 3: Off-Network Backup

Through the facilities of TAMU Corpus Christi, the GCOOS database is copied to a tape drive and stored at an offsite tape vault through the Iron Mountain (ironmountain.com) tape vaulting services. This is done quarterly or as needed.

7.4. Level 4: Long-term Archive

GCOOS maintains a *Web Accessible Folder* (WAF) that is also used as an endpoint from where *NOAA's National Centers for Environmental Information* (NCEI) use to pull data for archive. To facilitate the harvest, GCOOS maintains two manifests of data, using SHA384SUM function of CentOS, that can be archived. The first, SHA384SUM_Complete, lists the SHA-384 function results for all the files while the second, SHA384_Archive, is used by NCEI that list the SHA-384 function results for files to archive for all files where LDNs expressed desire to archive in NCEI.