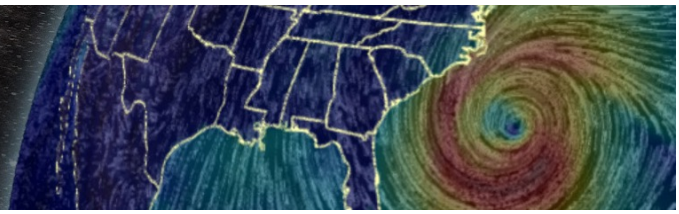
NOAA Earth System Research Laboratory

Global Systems Division



GOSA: Global Observing Systems Analysis Group

The Global Observing Systems Analysis (GOSA) Group helps NOAA cost-effectively identify and prioritize current and future observing system solutions to improve the skill of NOAA's weather prediction models.

OSEs and OSSEs save time and taxpayer money

An **OSE (Observing System Experiment)** evaluates real data from current observing systems, but cannot analyze the impact of the new data

An **OSSE (Observing System Simulation Experiment)** simulates observations made by planned instruments on future observing platforms before anything is built or deployed. They can operate numerical forecast models with and without the new simulated data. Differences in forecast performance can tell us the impact of the new data.

GOSA Research Areas

Unmanned Aircraft Systems (UAS)

Through OSEs and OSSEs, GOSA evaluates and tests targeted observations using Unmanned Aircraft Systems (UASs). UASs collect atmospheric observations and other crucial environmental information to help predict high-impact weather. GOSA is a key participant of the SHOUT (Sensing Hazards with Operational Unmanned Technology) Program.

GOSA has supported several NOAA UAS campaigns, such as the El Niño Rapid Response Rapid Response in early 2016 and SHOUT in 2015, by providing primary guidance in mission targeting and planning. GOSA leads development on target observation techniques to estimate optimal flight paths for aircraft deployment. Target observation techniques identify regions over the globe that are very sensitive to large model forecast error. Forecasts of significant events such as tropical storms, winter storms and major floods can be improved by increasing the number of observations over these regions.

The long duration and large oceanic areas that can be observed using advanced UAS such as the Global Hawk make this UAS a potentially

A UAS collects data over the Pacific Ocean during NOAA's El Niño Rapid Response mission. The UAS transmitted data can be ingested into models to improve their accuracy.

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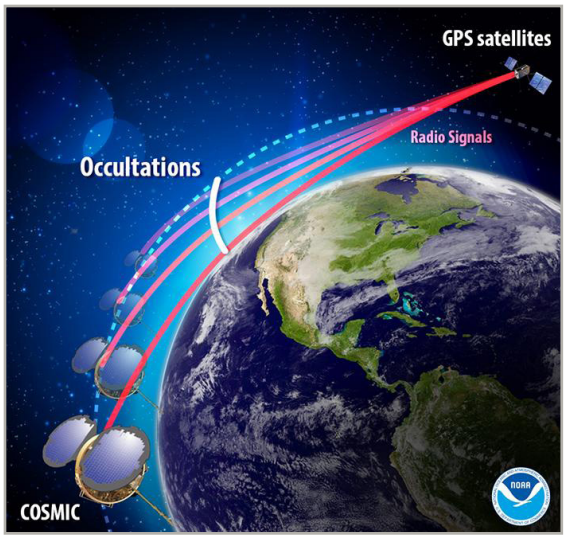
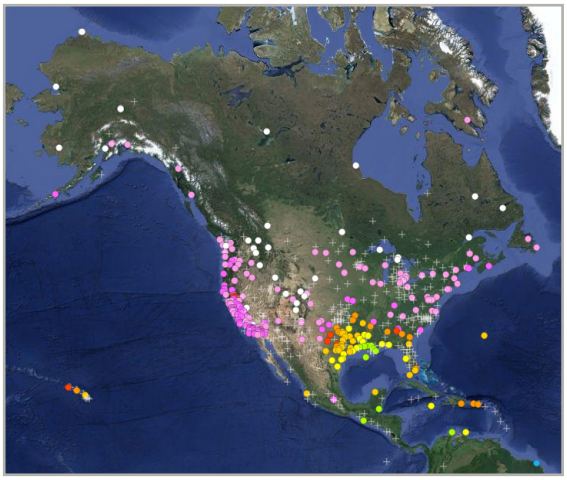


important observing platform, for environmental assessment and forecasting.

Radio Occultation (RO) Technology

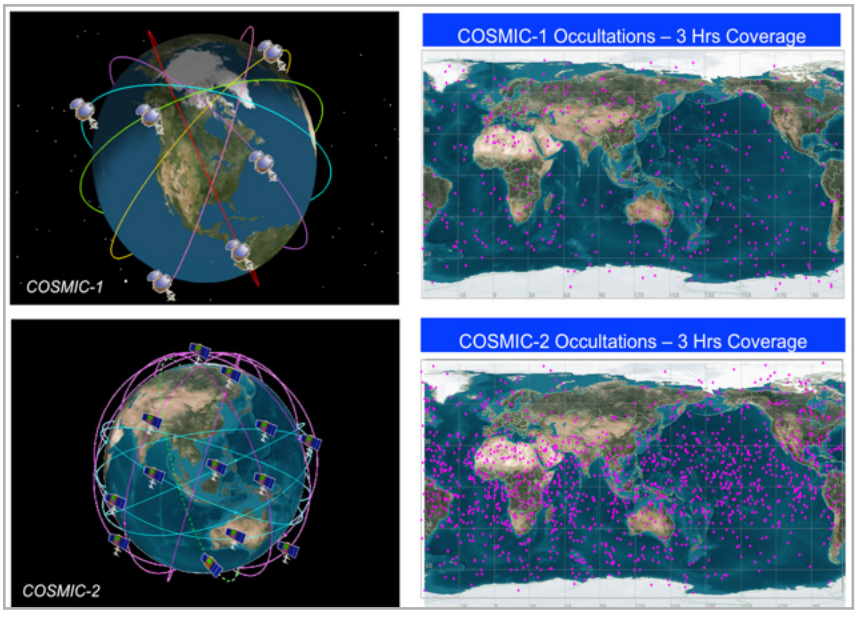
The GOSA Group leads NOAA's research using Radio Occultation (RO) data as input to global and regional weather forecast models. RO technology indirectly measures temperature, pressure, and water vapor in the atmosphere using rays connecting a Global Navigation Satellite Systems (GNSS) transmitter and a Low Earth Orbit (LEO) satellite. Low-cost RO soundings are ranked as one of the top contributors in improving global forecasting skill. RO soundings:

- Are all-weather, minimally affected by aerosols, clouds or precipitation
- Have global coverage
- Provide high accuracy over land as well as over oceans
- Have very high vertical resolution
- Are capable of resolving small vertical structures
- Have no instrument drift, no need for calibration
- Have no satellite-to-satellite measurement bias



Ground-Based Global Positioning System (GPS-Met)

The GOSA Group leads NOAA's research into ground-based Global Navigation Satellite Systems (GNSS) technology. A GNSS receiver placed on the surface of the Earth, rather than in a Low-Earth Orbit satellite, can derive a very precise time-series of precipitable water estimates at the location of the receiver. These observations can be assimilated in operational weather models to improve analyses and forecasts, particularly of the moisture field. GOSA is leading work on the assimilation of ground-based products with global coverage in NOAA's operational global models.



Constellation Observing System for Meteorology, Ionosphere, and Climate

Since its launch in 2006, the COSMIC constellation of six satellites has been the mainstay of the global RO system. However, COSMIC is already past the end of its formal lifetime, and only two satellites are still operating. The COSMIC-2 mission, a 12-satellite constellation, will replace COSMIC and be deployed in two launches. The first six satellites will be deployed in 2017 in a low-inclination orbit for dense equatorial coverage. The second six are expected to be deployed later in a high inclination