



# Earth Science System Components

## Earth Observation Sources

<b>NASA-LED</b>	LAGEOS I ERBS UARS TOPEX/Poseidon LAGEOS II TOMS-EP TRMM QuikSCAT
	Terra ACRIMSAT SRTM NMP-EO1 GRACE Aqua SORCE ICESat
	Aura CloudSAT CALIPSO NPP GPM Aquarius OCO GLORY
	TIMED IMAGE FAST Voyager TRACE ACE RHessi Wind
	Polar ST5 STEREO AIM THEMIS MMS SDO
<b>SPACE-BASED MISSIONS</b>	Landsat 5 GOES 8-12 POES 15-17 Landsat 7 GOES N-P POESS N-N NPOESS-1 GOES R
<b>Interagency Partnerships</b>	CINDI TWINS
<b>International Partnerships</b>	ERS I/II CHAMP SAC-C Jason-1 METEOR 3M FedSAT OSTM
	SOHO Geotail Cluster Ulysses Solar-B
<b>Commercial Partnerships</b>	OrbView-1 OrbView-2
<b>SUBORBITAL CAMPAIGNS</b>	CAMEX-4 TRACE-P SOLVE SOLVE II THORpex CLPX CRYSTAL-FACE AIM
	SMEX03/04 INTEX-NA NACP TCSP TWP QPF SOCP
<b>GROUND-BASED NETWORKS</b>	AERONET FLUXNET MPLNET SHADOZ GPS VLBI AGAGE SLR
	MOBY NDSC CMDL

## Physical Parameters

	Agriculture
	Atmosphere
	Biosphere
	Climate Indicators
	Cryosphere
	Human Dimensions
	Hydrosphere
	Land Surface
	Oceans
	Paleoclimate
	Solid Earth
	Spectral / Engineering
	Sun-Earth Interactions

## Models & Analysis Systems

<b>NASA-LED</b>	GEOS-5 AGCM GMAO Atmospheric Analysis GMAO Ocean Analysis GSFC LIS
<b>EARTH SYSTEM MODELING FRAMEWORK</b>	GFDL B-grid Atmosphere GFDL MOM4 Ocean GFDL HIM Ocean GMU Ocean CLM NCAR CAM
<b>PARTNER-LED MODELS</b>	NCEP Analysis NCEP Atmosphere LANL HYPOP LANL CICE LANL POP Ocean MITgcm Ocean
	MITgcm Atmosphere ECCO OSE NCEP/NCAR WRF UCLA AGCM Finite Difference Global Atmosphere
<b>NASA-LED</b>	GSFC Catchment LSM RAOMS GSFC GOCART Mosaic LSM GISS Model III GISS ModelE
	GEOS-4 AGCM SIB2 CASA GSFC 2D Model GSFC GMI CTM GSFC CTM MoST
	GSFC Ocean Biology GSFC Ozone Assimilation System GSFC CEM CM4 EGM96 GSFC Aerosol Assimilation System
<b>MODELS USING EARTH-SUN OBSERVATIONS</b>	GEOS-CHEM SMOKE AGWA CHMS-CCM WACCM
	CIP Analysis FIP Analysis SWAT RUC Hysplit4
	NCWF NCVP GTG Analysis WAVEWATCH III MMS
<b>PARTNER-LED MODELS</b>	NCAR TIME-GCM OpenGCM RCM BATS-R-US IH
	BATS-R-US GM BATS-R-US SC BATS-R-US EEG BATS-R-US IE GITM

## Model Outputs / Predictions

<b>PREDICTIONS OF NATURAL HAZARDS</b>	Hurricanes and Typhoons Severe Local Storms Winter Snow Storms Floods Droughts
	Earthquakes Volcanic Eruptions Probability of Extreme Weather Events Magnetic Storm Studies
<b>WEATHER PREDICTIONS</b>	Short Term Weather Forecasts Mid-Long Term Weather Forecasts Space Weather
<b>CLIMATE PREDICTIONS</b>	Local & Global Long-Range Prediction of Pollutants Regional/Global Ocean State Seasonal Forecasts Long Term Regional/Global Seasonal Surface Temperature Forecast
	Atmospheric Chemistry Change Assessment Chemistry-Climate Change Long-Term Regional/Global Seasonal Precipitation Forecast Large-Scale Hydrology Studies
	Regional/Global Atmosphere State Seasonal Forecasts Seasonal Forecasts El Niño/ La Niña Regional/Global Land State Seasonal Forecasts
<b>INTERDISCIPLINARY PREDICTIONS</b>	Land Cover/Land Use Projections Ecological Forecast CO2 & CH4 Atmospheric Concentration Projections Soil Moisture Change Projections Prototyping Earth System Modeling Framework
	Evapotranspiration Change Projections Geodynamo Runoff Change Projections Carbon Change Predictions Biogeosciences
	Wind/Wave Projections Precise Orbit Determination

## Decision Support Tools

<b>MANAGEMENT</b>	Crop Assessment Data Retrieval and Evaluation (CADRE) Community Multiscale Air Quality Modeling System (CMAQ) AIRNow National Air Space-Aviation Weather Research Program (NAS-AWRP) COLEST
	Hazardous Air Pollutant Mapping System (HAPMS) Coastal Real Time Warning System (CREWS) General NOAA Air Modeling Environment (GNOME) National Sea, Air, and Land Transportation Weather Observation & Forecasting System (NSAWFS) Advanced Weather Interactive Processing System (AWIPS)
	HOMER The Mississippi Optimization Model (HOMER) HAZUS Risk Prediction Regional Visualization & Monitoring System (RIMS) Tropical Observation and Prediction System (TOPS) NatureServe Vista
	Plague Surveillance System SolarSizer RETScreen Interagency Modeling and Atmospheric Assessment Center (IMAAAC) Invasive Species Forecasting System (ISFS)
	AHP Advanced Hydrologic Prediction Service (AHPS) Environmental Public Health Tracking Network Malawi Modeling and Surveillance Rapid Synoptic Validation Project (RSVP) Agri And Ocean Forecasting (AOF)
	BASINS Better Assessment Science Integrating Point and Nonpoint Source (BASINS) RiverWare BIOGREEN Natural Resource Decision Support System CAMEO Computer-Aided Management of Emergency Operations CAPS Center for Analysis and Prediction of Storms
	FEPS Fire Emission Production Simulator LINK ArcGIS Tools For Conservation Planning SELM South Florida Land Management Sustainable Water Supply Geocommunicator National Integrated Land System
	PORTS Physical Oceanographic Real-Time System
<b>POLICY</b>	Process Global Climate Assessment Model (PGCAM) Mini Climate Change Assessment Model (MiniCAM) National Energy Modeling System (NEMS) Community Multiscale Air Quality Modeling System (CMAQ) Sea Level Rise Coastal Inundation

### Chart Legend

- ADEOS II (Japan) - Observation System; mission partners in parentheses
- SeaWinds - NASA Instrument on non-NASA mission
- Sun - Parameters/Models/Predictions that are currently available
- Satellite - Decision Support Tool
- Red line - Delineates boundary between NASA-led and partner-led Earth Science components
- Light blue box - Earth Science Mission
- Yellow box - Sun-Solar System Science Mission / Model
- Light blue box with red border - Earth Science Mission In Development
- Yellow box with red border - Sun-Solar System Science Mission / Model In Development

<http://www.asd.ssc.nasa.gov/m2m>

### Earth Science Labs

Global Hydrology and Climate Center, Laboratory for Atmospheres, Short-term Prediction Research and Transition Center, Laboratory for Hydrospheric Processes, Community Coordinated Modeling Center, Langley Science Directorate, Laboratory for Terrestrial Physics, Goddard Institute for Space Studies, The Goddard DAAC, Goddard Distributed Active Archive Center, Alaska SAR Facility, National Center of Snow & Ice Data Center, National Center for Earth Observing System Data and Information, Earth Science Information Partners, Global Hydrology Resource Center, Atmospheric Sciences Data Center, High Performance Computing and Communications, Land Processes Distributed Active Archive Center, Oak Ridge National Laboratory Distributed Active Archive Center

### Partner Labs

National Centers Environmental Prediction, National Centers for Environmental Prediction, Geophysical Fluid Dynamics Laboratory, Air Resources Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, Network for Earthquake Engineering Simulation, Los Alamos National Laboratory, Pacific Northwest National Laboratory

### Domestic Partners

Dept. of Commerce, NOAA, Dept. of Transportation, EPA, Dept. of Homeland Security, Federal Emergency Management Agency, Office of Naval Research, NMA, U.S. Air Force, Dept. of Defense, Dept. of Interior, Dept. of Agriculture, Bureau of Reclamation, USGS, National Forest Service, National Institutes of Health, Center for Disease Control, Dept. of Energy, FAA, National Science Foundation, National Spatial Data Infrastructure

### International Partners

CEOS, ROSHYDROMET (Russia), The Italian Space Agency, CNES, National Center of Space Studies (France), JAXA, German Aerospace Center, The Netherlands Agency for Aerospace Programs, EUMETSAT, European Organization for Earth-Satellite Exploitation of Meteorological Satellites, Canadian Space Agency, Commonwealth Science & Industrial Research Organization (Australia), eesa, European Space Agency, Cooperation Research Center for Satellite Systems (Australia), AEB, AERONET, National Institute of Space Research (Brazil)

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