Research Products

ESRL Physical Sciences Division
Science Review
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PSD Research Products

PSD produces a wide range of research products that include observational data sets, display tools, analysis products, forecast, decision support and situational awareness tools, physical process model parameterization, assessments, model outputs, climate and weather analyses and reanalyses, etc. These products are available to research groups, academic institutions, operational entities across NOAA, commercial organizations, decision makers and the general public. In large part they can be accessed via the PSD website (http://www.esrl.noaa.gov/psd/). A representative sample is shown below.

Product	Description	Users	Benefits/Impacts	PSD Contact
20th Century Reanalysis version 2 (1871-2012) and 2c (1851-2011)	Global reconstruction of weather every six hours from the surface of the earth to the tropopause back to 1851	Broad community including research scientists, students, economists, historians, national met services, US Army Corp of Engineers, wind energy industry, reinsurance industry	Provides first global weather reconstruction with quantified uncertainties back to the 19th Century	Gilbert Compo
A spatially comprehensive, daily hydrometeorological data set for Mexico, the conterminous U.S., and southern Canada: 1950-2013.	A ~ 6km gridded product (1/16 degree) of station observed precipitation, maximum and minimum daily temperature and derived hydrologic states and fluxes	Broadly applicable for downscaling studies, water balance studies, and for driving models	Provides a high resolution characterization of meteorology for a multi-decadal period and hydrologically-relevant horizontal resolution	Ben Livneh
All digital automated frost/heat forecast system	Utilizes real-time vineyard observations to bias correct numerical model and model statistical output to forecast from 1 to 5 days out the occurrence of frost or heat at each vineyard.	Sonoma County Water Agency, Western Weather Group, Fox Weather, Sonoma County Winegrape Commission, Mendocino Winegrape, Commission	Improved frost/heat forecasts to improve water resource management within the Russian River Basin	David Reynolds
Arctic Summer Cloud Ocean Study - ASCOS (Cloud Database)	Cloud macro and microphysical measurements and retrievals from a suite of Ka-band cloud radar, multichannel radiometer, and ceilometer; obtained near 87 N during the month of August 2008	International Arctic researchers	Are being used to validate models and reanalyses in the Arctic, and to improve forecasting of sea ice	Ola Persson
Arctic Summer Cloud Ocean Study - ASCOS (Wind Profiler Database)	Wind profiles and backscatter from the only ship based 449 MHz wind profiler in the world. A platform made to fit on the Swedish icebreaker Oden makes this possible. Data collected near 87 N during the month of August 2008.	International Arctic researchers	Will be used to validate models and reanalyses in the Arctic, and to better understand air-ocean and air-ice interactions and provide sea-ice forecasts	Ola Persson

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Assessments of the causes of high-impact weather events and regional climate trends	Utilize observational data and experiments with climate and hydrological models of different complexity to determine the physical factors that cause observed regional and seasonal climate trends and high-impact weather events.	Policy and decision makers, General public	Provide best available science regarding factors causing high-impact weather and climate related extremes to make informed decisions on how society should invest in critical infrastructure in risk-prone areas while ensuring resilience. (http://www.esrl.noaa.gov/psd/csi/)	Judith Perlwitz
Atmos. River Water Vapor Flux Tool	Combines observations of wind profiles and integrated water vapor (IWV) to measure the IWV flux in the controlling layer and compares to operational numerical weather prediction prior and future forecasts	NWS weather and river forecasters, water managers, research scientists	Improved situational awareness of how well operational models are portraying atmospheric river conditions and resulting orographic precipitation	Daniel Gottas
Atmospheric River Detection Tool	Automated objective software package to aid in the identification and characterization of atmospheric rivers to assist forecasters	NWS and science community	Improves ability to help identify potential threats of extreme precipitation	Gary Wick
CNRFC 6 hourly QPE/ QTE at the HRAP resolution (Hydrologic Rainfall Analysis Project, ~4.7-km) XMRG dataset: 2011-2014	Four years of the California Nevada River Forecast Center (CNRFC) precipitation and temperature datasets with the XMRG (binary) format.	Hydrologic modelers who run the Hydrologic Laboratory - Research Distributed Hydrologic Model (HL-RDHM) and scientists in NWS/ Office of Hydrologic Development	The datasets are geo-referenced and format converted. They can be used directly to drive the distributed hydrologic model to obtain distributed hydrologic states. These states will benefit the subsequent hydrologic predictions.	Chengmin Hsu
Database of Air-Sea Flux measurements	NOAA-PSD hosts a database of ship-based flux observations going back to 1992. Several synthesis files containing multiple cruises are included.	Researchers developing methods to produce global flux products from satellite observations. NWP and Climate model developers. Algorithm developers.	Direct observations of air-sea fluxes remains in the domain of campaigns executed by teams of experts. Reliable data from the open ocean are extremely sparse. Fluxes are difficult to simulate and verify in models.	Christopher Fairall
Evaporative Demand Drought Index (EDDI)	A drought monitoring and early warning tool. EDDI.	U.S. Drought Monitor, state climatologists, municipal water operators.	Provide early warning of incipient drought and monitoring of ongoing droughts.	Michael Hobbins

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Facility for Climate Assessments (FACTS)	A 25TB data set of global historical climate simulations with multiple models spanning 1871-present, different forcing streams, large ensemble. Capabilities to visualize, intercompare online with OBS and among models, download data.	Broad community, including academia, research scientists.	Rapid and near real-time capability to assess physical factors causing climate conditions through time.	Don Murray
Fairall-Banner sea-spray flux algorithm	A set of computer codes that allow estimation of air-sea momentum, heat, and moisture fluxes at hurricane wind speeds. Accounts for the effects of sea spray.	NCEP, Navy, NASA, several Universities.	This algorithm allows a hurricane model to account for the thermo-dynamic and dynamic effects of sea spray on the surface interactions.	Christopher Fairall
Forecast Reference Evapotranspiration (FRET)	Bias-correction of FRET	Growers, agricultural outreach workers, irrigators.	Provide 1- to 7-day, CONUS-wide forecasts of reference ET, for more efficient irrigation scheduling.	Michael Hobbins
Global Ensemble Forecast System Reforecast Data Set and Derived Products	A 150 TB data set of global ensemble forecasts and a wide range of experimental forecast guidance based on these, including week-2 temperature and precipitation forecasts (for CPC), week +1 precipitation forecasts (for HPC and others), weeks +1 to +2 tornado forecasts (for SPC).	NWS and broader community	Improved forecasts through statistically post-processed guidance based on internally generated GEFS reforecasts; see http://www.esrl.noaa.gov/psd/forecasts/reforecast2/	Thomas Hamill
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Hydrologic Model Performance Assessment Tool	A set of R codes for calculating the performance metrics of hydrologic modeling. The developed metrics include Nash-Sutcliffe Efficiency, Runoff Volume Difference, Modified Correlation Coefficient, Percent Bias, and Time to Peak. These functions can also automatically detect the miss of the USGS streamflow data to ensure the model assessment being executed on the apple-to-apple basis.	Modelers and forecasters	This tool allows modelers to evaluate their simulations right away after outputs are generated. The codes can also be compiled with C compiler and adapted into the hydrologic forecast system such as the CHPS-FEWS. This makes model diagnoses more efficiently and modelers easy to get the insights about model structure and parameters.	Chengmin Hsu
Integrated Characterization of Energy, Clouds, Atmospheric state, and Precipitation at Summit (ICECAPS) near-real time web page	Web page hosting near-real time measurements and data products from a suite of ground-based remote and in situ sensors characterizing the atmosphere, clouds, and precipitation at Summit Station on top of the Greenland Ice Sheet.	Arctic and Greenlandic climate researchers, operational forecasters, satellite algorithm developers, instrument developers	This tool provides near-real time insight into the conditions occurring over the Greenland Ice Sheet to facilitate research on a number of scales and for a number of international institutions and agencies. These observations also allow for process-level studies related to the mass and energy budgets of the Greenland Ice Sheet.	Matthew Shupe
International Surface Pressure Databank V3	The world's largest collection of pressure observations from 1856-2012. The ISPDv3 is a blend of many national and international collections of station, marine and tropical cyclone best track pressure observations.	NOAA, NASA, and International Reanalysis researchers.	Essential to providing an observational underpinning to retrospective climate analysis datasets. These Reanalysis products are used extensively in climate research, applications and services.	Gilbert Compo
MRMS NetCDF-XMRG Format Transformation Tool	A set of Python codes which can transform the 1-km resolution Multi-Radar Multi-Sensor (MRMS) QPEs between the NetCDF and XMRG format. The tool also possesses the capabilities to perform the geo-reference and aggregation functions.	Radar meteorologists and hydrologists	This tool makes radar data ready for hydrologic applications.	Chengmin Hsu
NOAA COARE bulk flux algorithm	A set of computer codes that allow estimation of air-sea or air-ice fluxes using bulk meteorological inputs. Meteorological and numerous trace gas fluxes are available.	NWP and Climate models, satellite flux products, Tao and Flux Reference buoys, ICOADS, blended flux products (WHOI OI, etc.).	Accurate and physically consistent flux estimates from simple inputs. Fit to 15,000 hours of direct measurements	Christopher Fairall

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NOAA multi-generational reference ET reanalysis.	Generation-0 complete and loaded up to USGS GeoData portal, where it is available to researchers.	Researchers, USGS National Water Census.	Assist in drought monitoring; as a climatology for FRET; as an input to actual ET input to USGS National Water Census.	Michael Hobbins
OLR Madden-Julian Oscillation Index (OMI) along with Real-Time Version (ROMI)	An index of the state of the Madden-Julian Oscillation that utilizes satellite-derived Outgoing Longwave Radiation (OLR) only, available through the PSD Web Server	Broad community, including academia, research scientists, and the private sector	A real-time index of the MJO based only on OLR reflects the state of the MJO convective field and avoids the potential pitfalls of other indices which rely on circulation. The OMI and ROMI also take into account the two dimensional distribution of OLR throughout the seasonal cycle avoiding the need for averaging in latitude, more precisely determining the MJO state throughout the year.	George Kiladis
Reanalyses and observed Datasets made available for researchers		Researchers to general public	Tools and Data allow users to investigate climate and weather processes using a fixed model dataset. The datasets are 3-D and extend back as far as 1871.	Catherine Smith
Reanalyses.org collaborative reanalysis wiki page	The website is a tool to facilitate comparison between reanalysis and observational datasets. Evaluative content provided by reanalysis developers, observationalists, and users; and links to detailed data descriptions, data access methods, analysis and plotting tools, and dataset references are available. Discussions of the recovery of observations to improve reanalyses is also a focus. The wiki framework encourages scientific discussion between members of reanalyses.org and other reanalysis	NOAA, NASA, and international Reanalysis and related dataset developers, researchers. Also, NOAA teams and the NOAA Climate Reanalysis Task Force.	The tools greatly facilitates providing up-to-date reanalysis model information and access information as well as communication of research projects involving reanalysis among scientists. Registered users are from countries and institutions over the globe.	Gibert Compo
Snow-level product	A patented method to detect the level of the atmosphere where snow changes into rain.	NWS weather and river forecasters, water managers, research scientists	Verification of model forecasts. Important variable to determine how much of mountain basin will generate runoff	Allen White

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Soil moisture and surface flux near-real time webpage	Webpage that allows users to display soil moisture, surface radiative, sensible, and ground heat fluxes, measured at NOAA Hydrometerological Testbed observing locations.	Operational flood forecasters, water managers, fish habitat management, remote sensing developers, hydrological and meteorological model developers	Provides near-real time, and historical access to research quality observations of soil moisture and the surface energy balance.	Robert Zamora
Swedish-Russian-US Research Cooperation that Focuses on Climate-Cryosphere-Carbon - SWERUS-C3 Arctic Cloud Summer Experiment - ACSE (Cloud Database)	Cloud macro and micro-physical measurements and retrievals from a suite of instruments consisting of a W-band cloud radar, multi-channel radiometer, and ceilometer; obtained near 87 N during the month of August 2008	International Arctic researchers	Will be used to validate models and reanalyses in the Arctic, and to better understand air-ocean and air-ice interactions	Ola Persson
Tiksi, Russia Observatory near-real time webpage	Web page hosting near-real time measurements and data products from a suite of ground-based sensors characterizing the surface and lower atmosphere at Tiksi, Russia	Arctic weather/climate researchers, operational forecasters, satellite algorithm developers, instrument developers	This tool provides near-real time insight into conditions occurring in Tiksi, Russia to facilitate research on a number of scales and for a number of international institutions and agencies. These observations also allow for process-level studies related to surface energy fluxes and surface change.	Taneil Uttal
Vertical Profile Tool	Website allows users to extract different atmospheric products showing the vertical profile of the atmosphere. The products include single or multiple profiles on a date, a vertical transect between 2 points, a skew-T plot and a time by height plot. Data is extracted from different reanalyses and starts in 1871.	Model developers, researchers, weather enthusiasts	Provides access to historic weather information for researchers, those wishing to compare models and those looking at historic weather events.	Catherine Smith

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Vertically Integrated Water Vapor Transport (IVT) GIS Tool	A Python-based function which can automatically calculate water vapor transport at each pressure level and take integral of them. The domain covers the Pacific Ocean, Western US, and Southern Alaska. The tool is suitable for calculating IVTs for the variables extracted from the MERRA and NARR datasets.	Research scientists, model developers, and forecasters	This tool facilitates the calculation of IVTs. It can benefit the identification of "Atmospheric River (AR)" phenomenon and can be used to quantify the interactive effects between ARs and topography.	Chengmin Hsu
WRIT: Web-based reanalysis IntercomparisonTools	A set of web tools for plotting maps and time series that allows users to compare reanalysis and observed datasets.	Research scientists, resource managers, universities	Provide information on how well reanalyses are doing for different regions, timescales and variables. That information can be used to improve models or determine which dataset to use in a research study. Allows user to quickly extract plots from reanalysis datasets.	Gilbert Compo