Operational Ocean Forecasting at the Naval Oceanographic Office

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The United States Naval Oceanographic Office (NAVOCEANO) runs operational ocean circulation models, forecasting ocean conditions out 72-168 hours on coastal, regional and global scales. Models are run on a prioritized daily schedule, and output is made available primarily to U.S. Navy customers. Globally, NAVOCEANO runs a HYbrid Coordinate Ocean Model (HYCOM) at 1/12° horizontal resolution. A separate implementation of HYCOM (the Arctic Cap Nowcast/Forecast System, ACNFS) is run for the Arctic region, which is coupled to the Los Alamos Community Ice Model (CICE). Coastal and regional implementations of the Navy Coastal Ocean Model (NCOM) are run at higher resolutions ranging from 0.3-3.7 km. Through this hierarchy of ocean models, NAVOCEANO is able to forecast conditions from the open-ocean to the near-shore, allowing our models to support a wide range of applications. This talk will give an overview of NAVOCEANO’ s state of the art operational ocean modeling capability, including a discussion of model configuration, meteorological and climatological forcing, methods of data assimilation, and the use of ocean model output as a forecasting tool.

Keywords: HYCOM, RNCOM

US Navy Operational METOC Forecasting System –Progress towards Earth System Prediction Capability

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The US Navy operates globally and requires the capability to forecast the ocean and atmosphere environment anywhere and anytime. Regional crises, natural disasters, search and rescue (SAR) are just some of the situations that can appear without warning and at almost any location around the globe. This motivates having a solution available and ready to respond. Once on scene, tactical scale operations require predictive capabilities from very high resolution numerical models. On a global basis this implies computational requirements beyond what is feasible with present day supercomputers. The US Navy approach is to nest higher resolution local forecast models into the global system to apply computer power where it is required. However, these environmental prediction systems traditionally have been built as stand-alone systems that predict each aspect of the battlespace environment such as the ocean, atmosphere, waves, and ice. Now the development direction is toward building fully coupled systems to include all these models and represent their interactive effects.
This talk will show the evolution of models used in the US Navy from the present uncoupled systems to the future coupled system called The Earth System Prediction Capability (ESPC) in development now and scheduled to be operational by the end of 2018.

Keywords: ESPC, METOC, Operational Forecasting, US Navy

The Summer Precipitation Response to the Lengths of the Preceding Winter over Yangtze-Huaihe River Valley

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Based on NCEP/NCAR reanalysis datasets and nonlinear similarity method, the Lengths of Preceding Winter(LPW) in the Yangtze-Huaihe River Valley(YHRV) has been divided from 1961 to 2011, we investigate the varies of LPW and the relationship between LPW and following summer precipitation, results indicate that: LPW clearly display interannual and decadal changes in the period of 1961-2011. The variations of LPW are closely related to temperatures, pressure and meridional wind speed. Compared with the climatic status, a longer LPW correspond to a lower temperature, a higher pressure and a stronger meridional wind, which shows that these three factors are probably the key factors of the adjustment of LPW. These characteristics also vary from region to region. There is significantly positive correlation between the Summer Precipitation and LPW. The statistical analysis also found that the longer/shorter the LPW, the more/less the summer precipitation in YHRV. The synthetic analysis of the circulation field indicate when LPW are significantly longer than climatic status, a blocking situation is formed easily in the region of Ural Mountains and the Sea of Okhotsk in the summer, which will affect the summer rainfall in YHRV. By using Singular Value Decomposition method, the relationship between Summer Precipitation and LPW is also very significant. This study is expected to provide a new perspective for short-term climate prediction and meteorological service.

Keywords: Summer Flood Season Precipitation, Nonlinear Similarity Method, Lengths of the Preceding Winter, Yangtze-Huaihe River Valley

A new forecasting method for the flood and heat wave in summer for the northern part of southern China

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The climate forecast for the flood and/or drought along the Yangtze River in China is a very important part of the climate service to the government. The operational meteorological forecast should be provided for the policies ahead. Thus how to use the precursors in winter for the prediction of flood and heat wave in summer is an important issue. Based on observed snow, precipitation and temperature data, NCEP/NCAR reanalysis data, and sea surface temperature data, the relationship between the number of winter snow cover days in Northeast China and the following summer’ s rainfall and high temperature in the northern part of southern China is analyzed and the possible underlying mechanisms discussed. Results indicate that a negative relationship is significant throughout the study period but is more obvious after the 1980s. The pre-winter circulation patterns in years of more snow cover days and less summer rainfall in the northern part of the area south of the Yangtze River are almost the same. In years of more snow cover days, lower temperatures in the lower level over Northeast China are found in winter and spring. The winter monsoon is weaker and retreats later in these years than in those with fewer snow cover days. In spring of years with more snow cover days, anomalous cyclonic circulation is observed over Northeast China, and an anomalous northerly wind is found in the eastern part of China. In summer of these years, an anomalous northeasterly wind at the lower level is found from the area south of the Yangtze River to the East China Sea and Yellow Sea; and with less southwesterly water vapor transport, the rainfall in the area south of the Yangtze River is less than normal, while the opposite patterns are true in years of fewer snow cover days. In recent years, the stable relationship between winter Northeast China snow cover and summer rainfall in the area south of the Yangtze River can be used for summer rainfall prediction. Significant negative correlation is found between hot days and precipitation to the south of the Yangtze River. Thus, more snow cover days in Northeast China in winter can be a predictor of more hot days and heat waves in the following summer in the area south of the Yangtze River. The results are of great importance to short-term climate prediction for summer rainfall and heat wave, which can be provided as references to the climate prediction service to the government.

Keywords: summer rainfall, heat wave, forecast

Climate Above Ground : Redux

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Climate above ground (CAG) has been actively studied since Rudolf Geiger’ s original manuscript in 1940. Most of the CAG studies employ use of measurement apparatuses at a height of >1 meter or simply rely on data collected from meteorological weather stations. There is a serious gap in understanding of climate within the first meter above ground. We have designed and deployed a sensor module equipped with temperature sensors evenly spaced between 0.16 meters and 1 meter above ground. We visualized the temperature variations at various heights, and compared the readings with readings made at a height of 1.2 meters, a commonly used height for temperature readings in the literature. We attest to the past findings of "nocturnal raised minimum".

Keywords: Boundary layer temperature , Boundary-layer meteorology , Vertical temperature profile, Sensor

