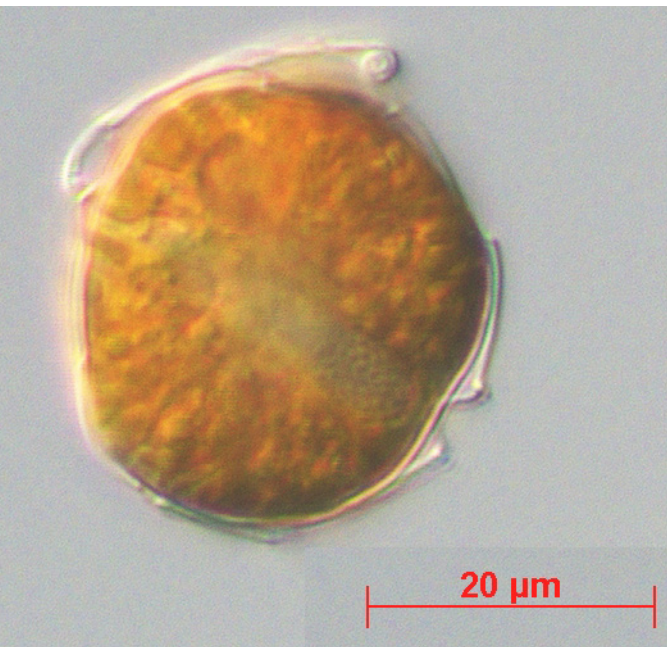


NOAA Scientific Publications Report

FEBRUARY 1, 2013

HIGHLIGHTED ARTICLE

Tornado Path Length Forecasts from 2010 - 2011 Using Ensemble Updraft Helicity

Multivariate Models of Adult Pacific Salmon Returns

U.S. Billion-dollar Weather and Climate Disasters: Data Sources, Trends, Accuracy and Biases

ADDITIONAL ARTICLES

U.S. Climate Reference Network Soil Moisture and Temperature Observations

Georges Bank: A Leaky Incubator of *Alexandrium fundyense* Blooms

Impacts of depleting forage species in the California Current

Updated analyses of temperature and precipitation extreme indices since the beginning of the twentieth century: the HadEX2 dataset

OTHER REPORTS, BOOK CHAPTERS, & INTERNAL PUBLICATIONS

None

HIGHLIGHTED ARTICLE

AUTHORS

Adam J. Clark (OAR/NSSL/CIMMS), Jidong Gao (OAR/NSSL), Patrick T. Marsh (OAR/NSSL/CIMMS), Travis Smith (OAR/NSSL/CIMMS), John S. Kain (OAR/NSSL), James Correia, Jr., Ming Xue, and Fanyou Kong

PUBLICATION DATE

Online January 2013

TITLE

Tornado Path Length Forecasts from 2010 - 2011 Using Ensemble Updraft Helicity

JOURNAL

Weather and Forecasting

SIGNIFICANCE

- Scientists continue to find better ways to predict tornadoes and tornado outbreaks.

SUMMARY

This paper adds new data to previous research that diagnosed a strong relationship between the cumulative path lengths of simulated rotating storms (measured using a 3-dimensional object identification algorithm applied to forecast updraft helicity) and the cumulative path lengths of tornadoes. The new forecast examples are from three major 2011 tornado outbreaks – 16 and 27 April, and 24 May, as well as two forecast failure cases from June 2010. Finally, analysis updraft helicity from 27 April 2011 is computed using a three-dimensional variational data assimilation system to obtain 1.25 km grid-spacing analyses at 5-minute intervals and compared to forecast UH from individual SSEF members. Forecast updraft helicity pathlengths during the spring could be a very skillfull predictor for the severity of tornado outbreaks as measured by total pathlengths.

Arlington, TX Tornado as it moved over Hwy 287: April 3, 2012

PRESS RELEASE

Web story likely.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

Brian J. Burke, William T. Peterson, Brian R. Beckman (NMFS/NWFSC), Cheryl Morgan, Elizabeth A. Daly, Marisa Litz

http://dx.plos.org/10.1371/journal.pone.0054134

PUBLICATION DATE

Published January 11, 2013

TITLE

Multivariate Models of Adult Pacific Salmon Returns

JOURNAL

PLoS ONE

SIGNIFICANCE

- For what has historically been referred to as a black box in the salmon life cycle, this work greatly improves the understanding of how the marine environment is related to adult salmon returns.
- We can explicitly take advantage of this information in a forecasting model to provide more accurate estimates of adult returns to managers in the Columbia River Basin, who use pre-season forecasts to set initial harvest limits.
- The importance of various ocean indicators to the marine portion of the salmon life cycle, as estimated here, can provide guidance for future research and monitoring sampling regimes.

Pacific Salmon

SUMMARY

Most modeling and statistical approaches encourage simplicity, yet ecological processes are often complex, as they are influenced by numerous dynamic environmental and biological factors. Pacific salmon abundance has been highly variable over the last few decades and most forecasting models have proven inadequate, primarily because of a lack of understanding of the processes affecting variability in survival. Better methods and data for predicting the abundance of returning adults are therefore required to effectively manage the species. We combined 31 distinct indicators of the marine environment collected over an 11 year period into a multivariate analysis to summarize and predict adult spring Chinook salmon returns to the Columbia River in 2012. In addition to forecasts, this tool quantifies the strength of the relationship between various ecological indicators and salmon returns, allowing interpretation of ecosystem processes. The relative importance of indicators varied, but a few trends emerged. Adult returns of spring Chinook salmon were best described using indicators of bottom-up ecological processes such as composition and abundance of zooplankton and fish prey as well as measures of individual fish, such as growth and condition. Local indicators of temperature or coastal upwelling did not contribute as much as large-scale indicators of temperature variability, matching the spatial scale over which salmon spend the majority of their ocean residence. Results suggest that effective management of Pacific salmon requires multiple types of data and that no single indicator can represent the complex early-ocean ecology of salmon.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

HIGHLIGHTED ARTICLE

AUTHORS

Adam B. Smith (NOAA/NESDIS/NCDC), Richard W. Katz

PUBLICATION DATE

TBD (Accepted January 23, 2013)

TITLE

U.S. Billion-dollar Weather and Climate Disasters: Data Sources, Trends, Accuracy and Biases

JOURNAL

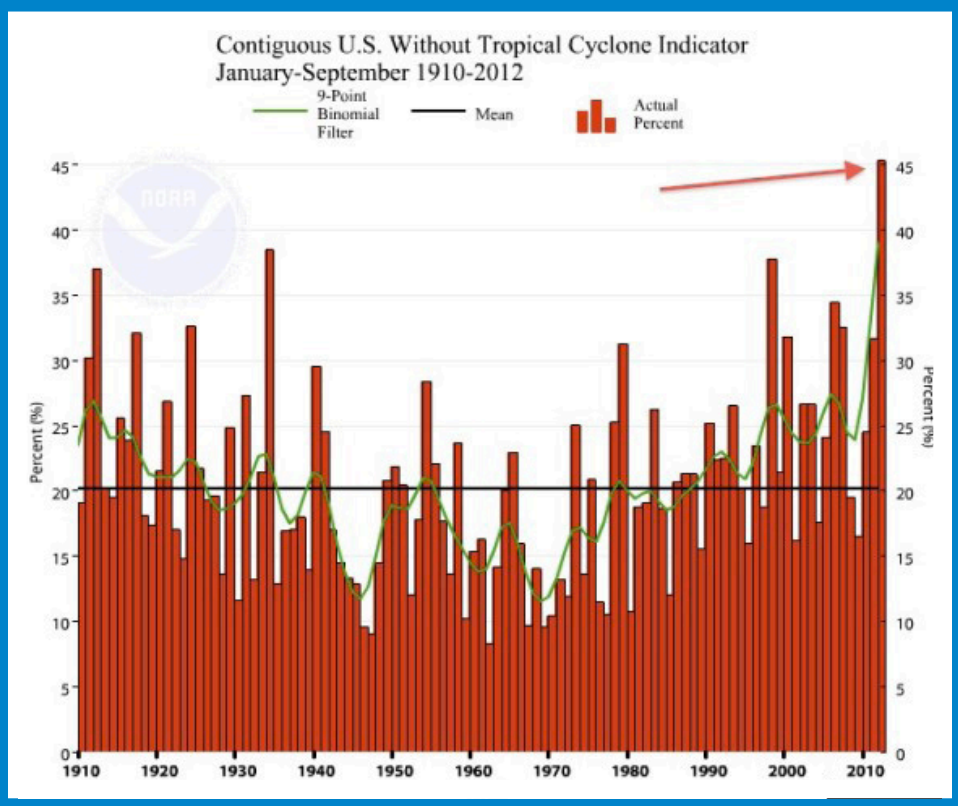
Natural Hazards

SIGNIFICANCE

- Current methodology was found to underestimate the average loss from billion-dollar disasters.
- Recommendations were made to refine existing approach to reflect geographic and temporal variations in insurance participation rates.

SUMMARY

This paper focuses on the current methodology for the production of the billion-dollar weather and climate disaster loss dataset, highlighting its strengths and limitations including sources of uncertainty and bias. It focuses on the U.S. Billion-Dollar Weather/Climate Disaster report by the National Oceanic and Atmospheric Administration's National Climatic Data Center. The current methodology for the production of this loss dataset is described, highlighting its strengths and limitations including sources of uncertainty and bias. The methodology uses a factor approach to convert from insured losses to total direct losses. An increasing trend in annual aggregate losses is shown to be primarily attributable to a statistically significant increasing trend of about 5% per year in the frequency of billion-dollar disasters. So the question arises of how such trend estimates are affected by uncertainties and biases in the billion-dollar disaster data. The net effect of all biases appears to be an underestimation of average loss. Recommendations concerning how the current methodology can be improved to increase the quality of the billion-dollar disaster dataset include refining the factor approach to more realistically take into account spatial and temporal variations in insurance participation rates.



2012 has, so far, had the most extreme weather on record in the lower 48 states, according to the Climate Extremes Index. Credit: NOAA/NCDC

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

J.E. Bell (Cooperative Institute for Climate and Satellites-North Carolina), M.A. Palecki (NESDIS/NCDC), C.B. Baker (OAR/ATDD), W.G. Collins (NESDIS/NCDC), J.H. Lawrimore (NESDIS/NCDC), R.D. Leeper (Cooperative Institute for Climate and Satellites-North Carolina), M.E. Hall (OAR/ATDD), J. Kochendorfer (OAR/ATDD), T.P. Meyers (OAR/ATDD), T. Wilson (OAR/ATDD), H.J. Diamond (NESDIS/NCDC)

TITLE

U.S. Climate Reference Network Soil Moisture and Temperature Observations

PUBLICATION DATE

Accepted January 2013

JOURNAL

Journal of Hydrometeorology

SIGNIFICANCE

- Drought is one of the most costly and increasingly common natural disasters in the the U.S. and this paper describes how the NOAA-operated U.S. Climate Reference Network (USCRN) has recently increased the network's capability of monitoring soil processes and drought.

Soil moisture sensors

SUMMARY

The USCRN is a network of climate-monitoring stations maintained and operated by NOAA to provide climate-science-quality measurements of air temperature and precipitation. The stations in the network were designed to be extensible to other missions, and the National Integrated Drought Information System (NIDIS) program determined that the USCRN could be augmented to provide more drought relevant observations. In 2011, at each USCRN station in the conterminous United States, the USCRN team installed triplicate configuration soil moisture and soil temperature probes at 5 standards depths (5,10,20,50, and 100 cm), and relative humidity sensors were also installed at each station. USCRN data are stewarded at NOAA's National Climatic Data Center (NCDC), while instrument engineering and performance studies, installation, and maintenance are performed by NOAA's Atmospheric Turbulence and Diffusion Division (ATDD). This article provides a technical description of the USCRN soil observations in the context of U.S. soil climate-measurement efforts, and discusses the advantage of the triple-redundancy approach applied by the USCRN.

ADDITIONAL ARTICLE

AUTHORS

D.J. McGillicuddy, Jr., D.W. Townsend, B.A. Keafer, M.A. Thomas, D.M. Anderson (all NOS/NCCOS)

www.sciencedirect.com/science/article/pii/S0967064512001890

PUBLICATION DATE

Accepted November 10, 2012

TITLE

Georges Bank: A Leaky Incubator of Alexandrium fundyense *Blooms*

JOURNAL

Deep-Sea Research II. Topics on Oceanography.

SIGNIFICANCE

- Blooms of *Alexandrium fundyense,* the toxic New England tide organism, on Georges Bank occurred in multiple years but are independent of the blooms in coastal Gulf of Maine. The factors controlling these blooms and their toxicity are not well enough understood yet to be predicted.

Alexandirium fundyense

SUMMARY

Populations of the toxic dinoflagellate *Alexandrium fundyense* on Georges Bank range on time scales ranging from synoptic to seasonal to interannual, based on oceanographic surveys . Blooms of *A. fundyense* on Georges Bank can reach concentrations on the order of 104 cells per Liter, and appear to be quasi- independent of those in the adjacent coastal Gulf of Maine. In contrast to coastal populations that rely on abundant resting cysts for bloom initiation, very few cysts are present in the sediments on Georges Bank. Bloom dynamics must therefore be largely controlled by the balance between growth and mortality processes, which are at present largely unknown for this population. Based on correlations between cell abundance and nutrient distributions, ammonium appears to be an important source of nitrogen for A. fundyense blooms on Georges Bank, which has a large shellfish resource which can be affected by toxicity from *Alexandrium* blooms.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

I. Kaplan (NMFS/NWFSC), C. Brown, E. Fulton, **I. Gray (NMFS/NWFSC), J. Field (NMFS/SWFSC)** and A. Smith

PUBLICATION DATE

Spring 2013

TITLE

Impacts of depleting forage species in the California Current

JOURNAL

Environmental Conservation

SIGNIFICANCE

- Depleting forage groups (i.e., lower trophic level (LTL) species) should be expected to impact higher trophic levels in the California Current
- Declines in higher trophic levels (i.e., predators of forage species) were estimated to exceed 20% from baseline biomass and productivity values when forage species were fished to approximately 40% of their unfished level.
- Depletion of euphausiids and forage fish, which each comprise > 10% of system biomass, had the largest impact on other species.

SUMMARY

Human demands for food and fish meal are often in direct competition with forage needs of marine mammals, birds, and piscivorous harvested fish. The authors used two well-developed ecosystem models for the California Current on the U.S. West Coast to test the impacts on other parts of the ecosystem of harvesting euphausiids, forage fish, mackerel, and mesopelagic fish such as myctophids. They found that depleting forage groups to maximum sustainable yield levels can have both positive and negative effects on other species in the California Current. The most common impacts were on predators of forage groups, some of which showed declines of >20% under the scenarios that involved depletion of forage groups to 40% of unfished levels. Depleting euphausiids to 40% of unfished levels altered the abundance of 13-30% of the other functional groups by >20%; while depleting forage fish to 40% altered the abundance of 20-50% of the other functional groups by >20%. The authors recommend that care should be taken in managing forage species populations, especially in terms of current management practices of other fish stocks. For example, higher trophic level species, such as groundfish, are often managed on the basis of reference points that can reduce biomass to below half of unfished levels. If similar practices were used for forage species, the authors suggest that removal of those species is likely to impact the abundance of other target species, protected species, and the structure of the ecosystem.

VISIT THE SCIENTIFIC PUBLICATIONS REPORT ARCHIVE

ADDITIONAL ARTICLE

AUTHORS

M.G. Donat, L.V. Alexander, H. Yang, **I. Durre (NESDIS/NCDC), R.S. Vose (NESDIS/NCDC),** R. Dunn, K. Willett, E. Aguilar, M. Brunet, J. Caesar, B. Hewitson, C. Jack, A.M.G. Klein Tank, A.C. Kruger, J. Marengo, **T.C. Peterson (NESDIS/NCDC),** M. Renom, C. Oria Rojas, M. Rusticucci, J. Salinger, S. S. Sekele, A.K. Srivastava, B. Trewin, C. Villarroel, L.A. Vincent, P. Zhai, X. Zhang, and S. Kitching

onlinelibrary.wiley.com/doi/10.1002/jgrd.50150/abstract

TITLE

Updated analyses of temperature and precipitation extreme indices since the beginning of the twentieth century: the HadEX2 dataset

PUBLICATION DATE

Appeared online on 22 January 2013

JOURNAL

Journal of Atmospheric Research - Atmospheres

SIGNIFICANCE

- Results showed widespread significant changes in temperature extremes consistent with warming, especially for those indices derived from daily minimum temperature over the whole 110 years of record but with stronger trends in more recent decades.
- Seasonal results showed significant warming in all seasons but more so in the colder months.
- Changes in precipitation were much more heterogeneous than temperature, however, results indicated more areas with significant increasing trends in extreme precipitation amounts, intensity, and frequency than areas with decreasing trends.

SUMMARY

In this study, we present the collation and analysis of the gridded land-based dataset of indices of temperature and precipitation extremes: HadEX2. Indices were calculated based on station data using a consistent approach recommended by the World Meteorological Organization (WMO) Expert Team on Climate Change Detection and Indices, resulting in the production of 17 temperature and 12 precipitation indices derived from daily maximum and minimum temperature and precipitation observations. High-quality *in situ* observations from over 6000 temperature and 11,000 precipitation meteorological stations across the globe were obtained to calculate the indices over the period of record available for each station. Monthly and annual indices were then interpolated onto a 3.75° x 2.5° longitude-latitude grid over the period 1901 -2010. Linear trends in the gridded fields were computed and tested for statistical significance.