

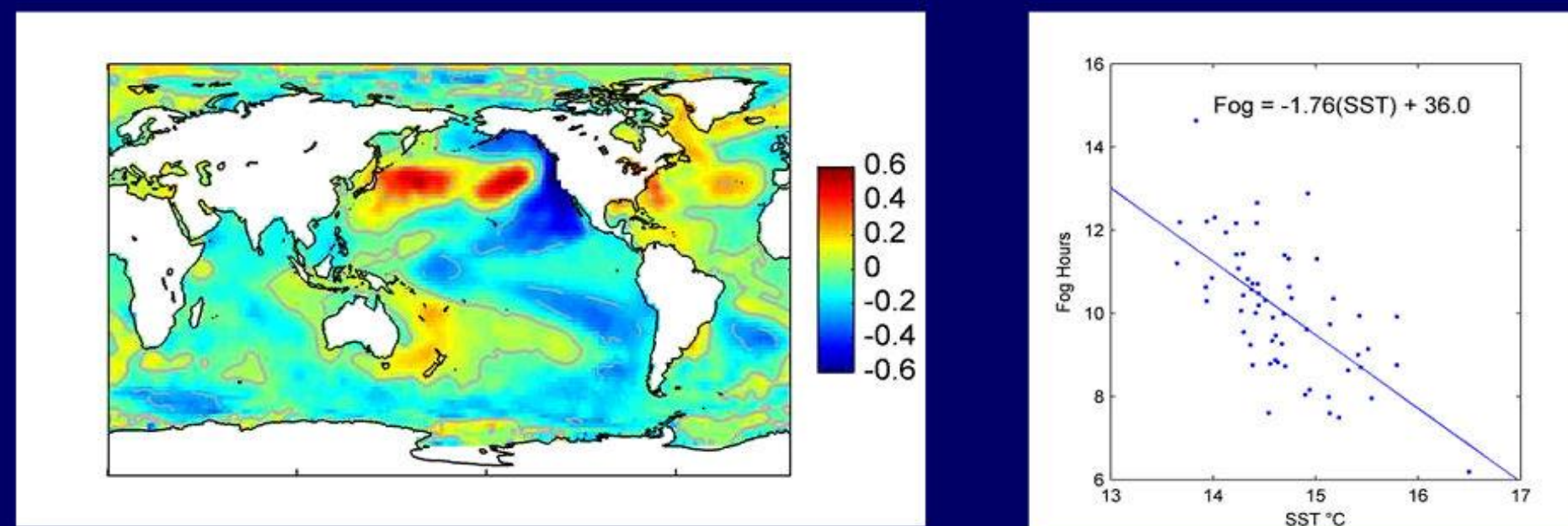
Project Overview

The Pacific Coast Fog Project pools the expertise from multiple science disciplines to provide regional and local climate and weather information on the frequency and character of fog for resource specialists to effectively manage land along the coast of California. The 12 panels in this poster show samples of contributions from collaborators.

A few other collaborators not mentioned in panels 1 -12: A Flint, L Flint, M Madej, C Ng (USGS) A. Jousse (UCLA) S Iacobellis, R Schwartz (UCSD) D Fernandez (CSUMB) C. Stills (UOregon) D Fischer, S Baguskas (UCSB) L Gallardo, R Garreaud, R Rondanelli (U. Chile) P.Cereceda (UC Chile) M. Masbou (U. Bonn) K. Redmond (DRI – Reno) L. Michelli (Pepperwood Preserve & TBC3) N.Gates, B. Becker, D. Hatch (U.S. National Park Service), J Dungan (NASA), A Gunther (BAECC).

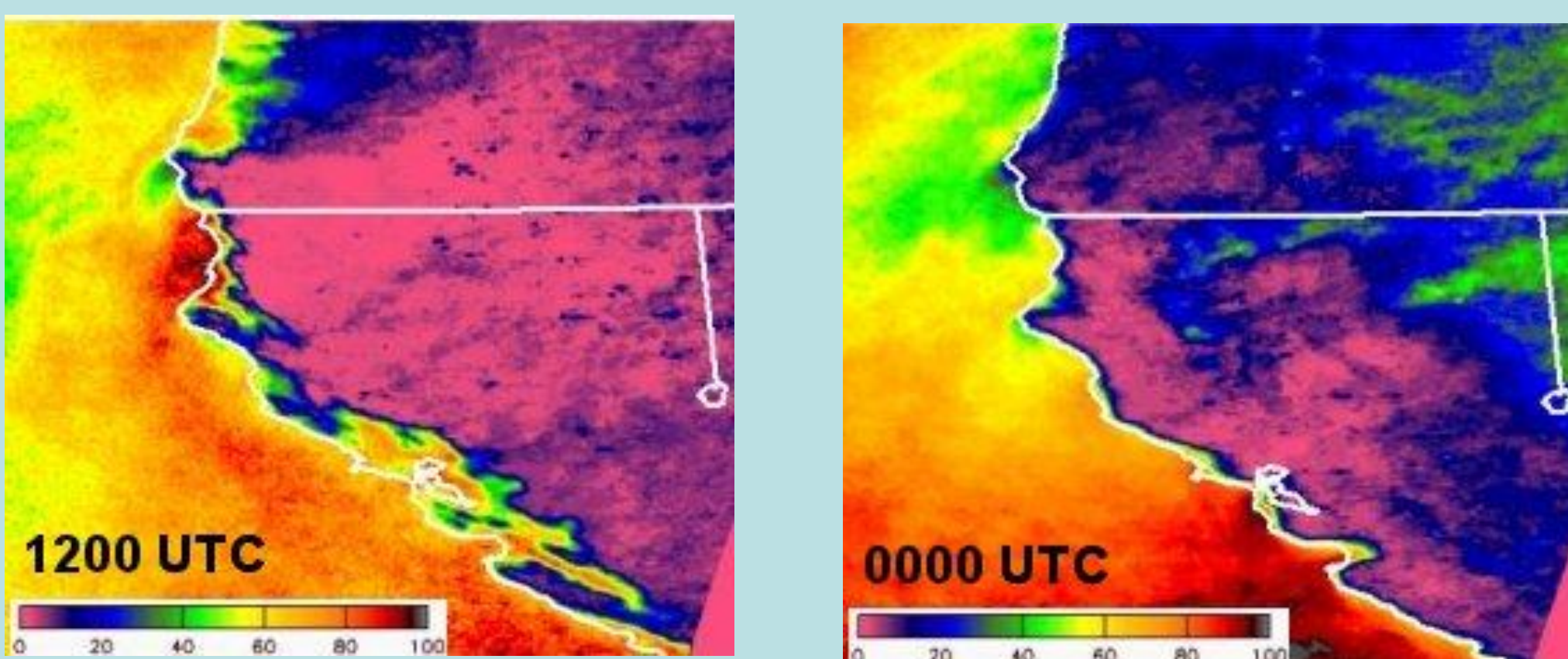
3. Inter-annual Effects (Pacific Decadal Oscillation)

Summer SST correlations with northern California summer fog



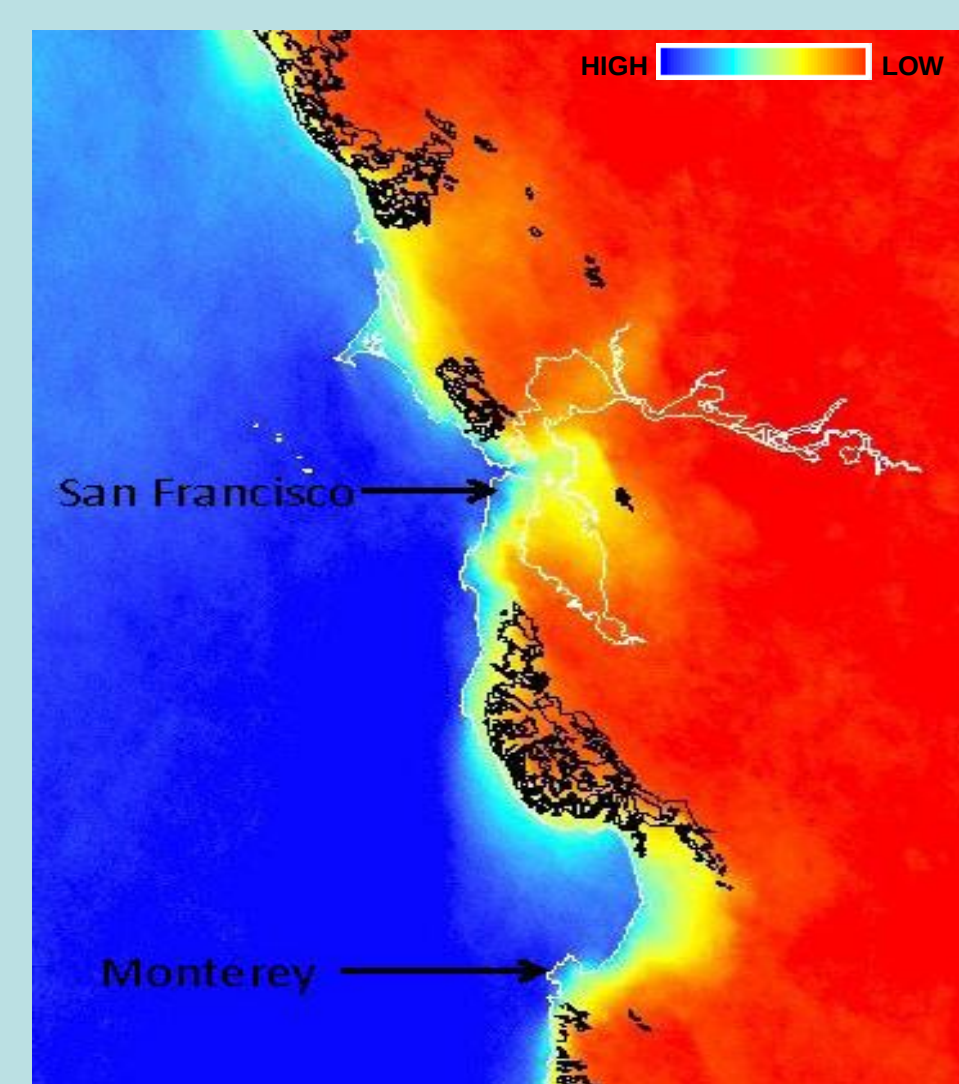
The foggiest summers along the CA coast are correlated with cooler SSTs and stronger northerly surface winds associated with the “cool phase” of the PDO (J. Johnstone, UW-Seattle)

4. Short Term (11-year) GOES Climatology



Low cloud frequency (%) at 1200 and 0000 UTC, July 15 - Aug 15, 1999-2009 for Marine Layer Depth of 751-1250m at 1200 UTC. (C. Combs, CIRA/CSU)

5. Short Term MODIS Climatology

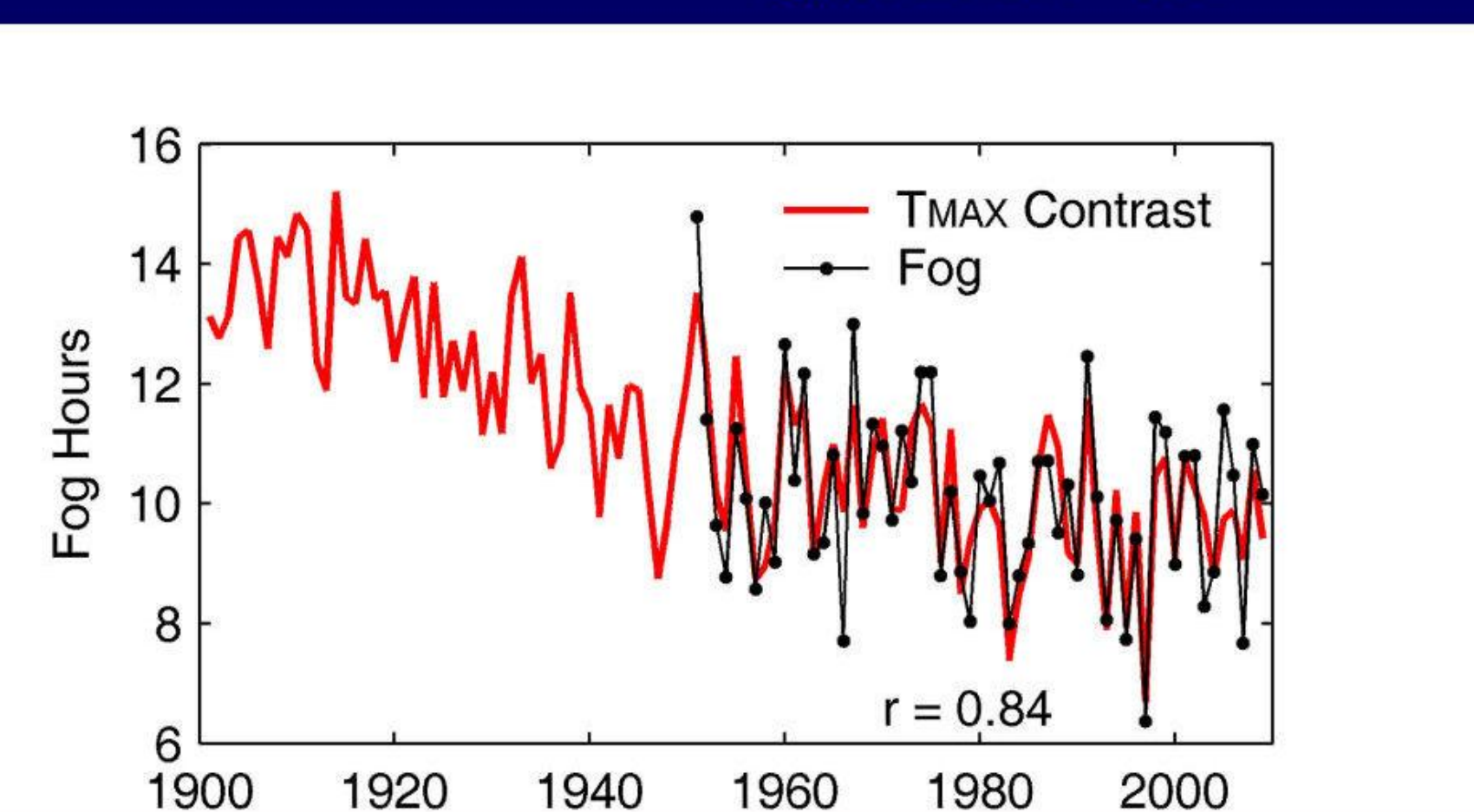


July/August 2000–2011 maxima from MODIS 10:30 AM cloud frequency (such as near San Francisco and Monterey) do not correspond to locations of redwood forests (black contours), suggesting the need for afternoon solar radiation, sheltered locations or optimum soil conditions. (E. Waller, UC-Berkeley)

2. Long Term Climatic Trends

T_{MAX} Inland-Coast Contrast 1901-2008

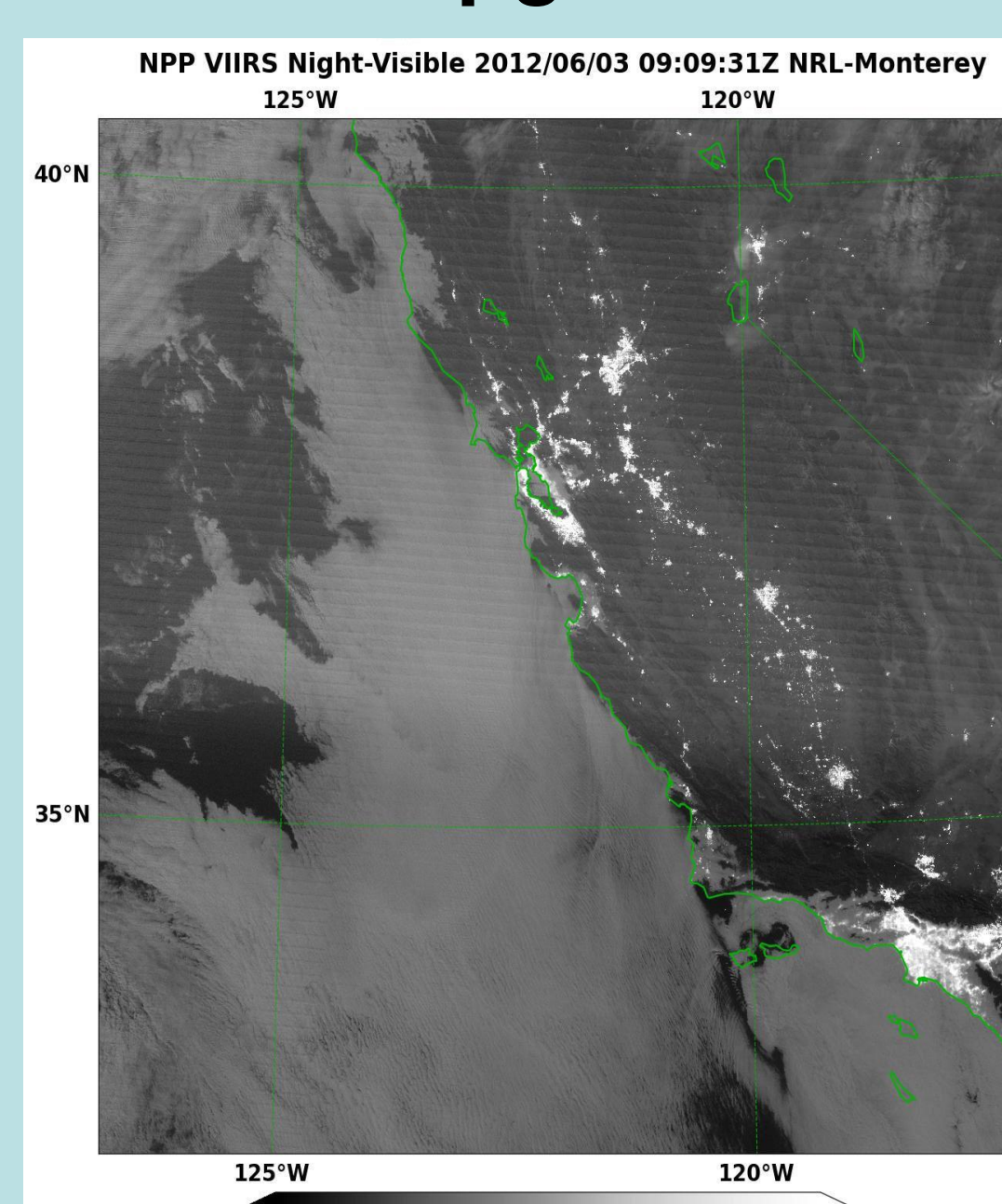
Fog correlation: $r = 0.84$



Suggests fog duration was ~3 hrs greater (+33%) in the early 20th century

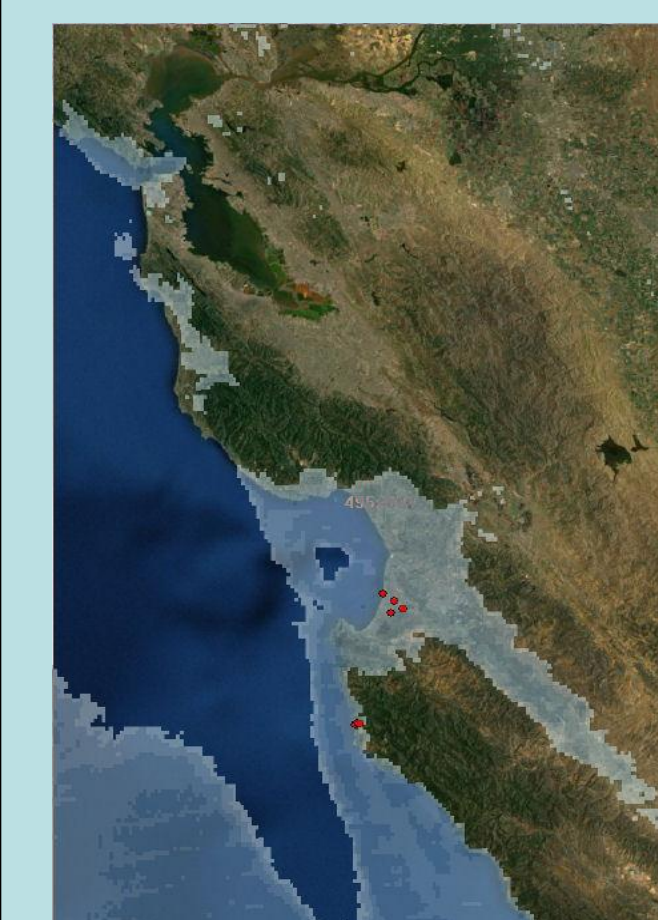
Correlation between maximum temperature contrast (inland to coast) and airport records of fog frequency can be extrapolated back to 1900 to infer that fog has diminished ~33%, although there has been an uptick in recent years possibly related to “cool phase” of Pacific Decadal Oscillation (PDO). Global warming could lead to an increase in coastal fog. (J. Johnstone, UW-Seattle)

12. Remote Sensing Upgrades

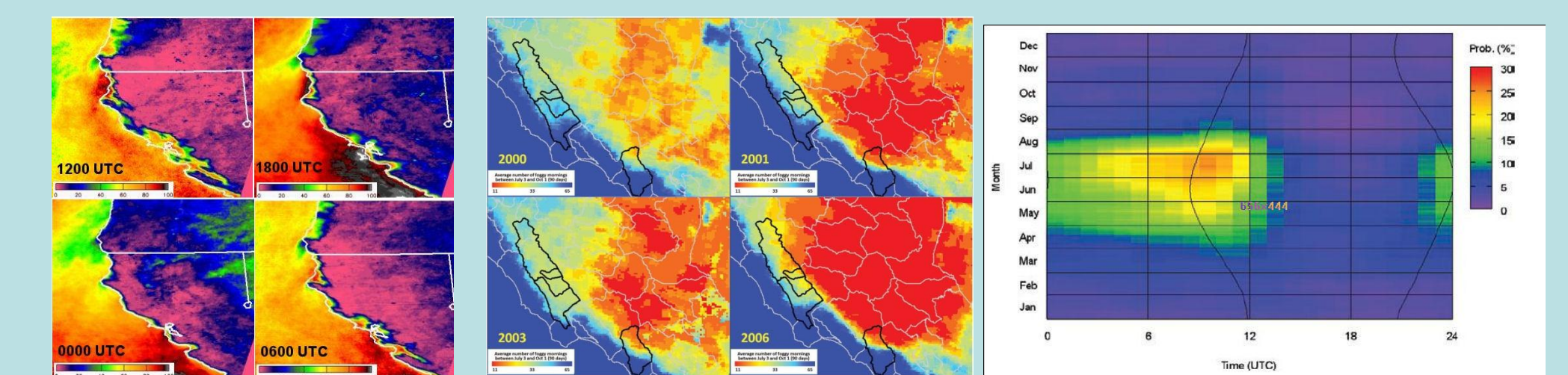


New satellite assets such as night visible from VIIRS on NPP (above) and GOES-R will enhance future observing capabilities (T. Lee, Naval Research Lab -Monterey)

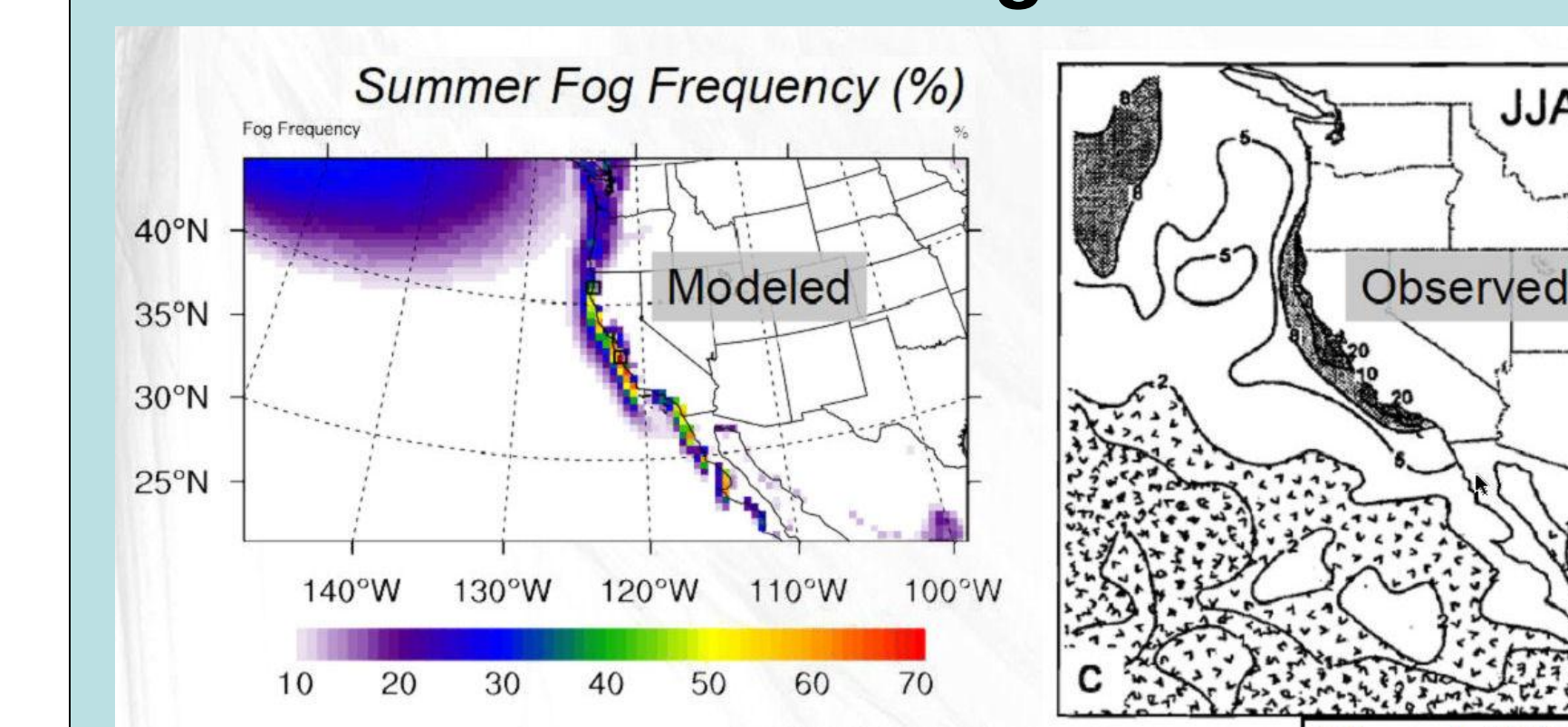
11. Possible User Product Formats



Observed low clouds from MODIS (light gray) overlain on Landsat image (left) (C. Potter & C. Hiatt, NASA), low cloud diurnal frequency from GOES (lower left) (Combs, CIRA), MODIS-based annual indices (P. Williams, Los Alamos) or fog frequency for any given day of the year (lower right) (Gultepe et al 2007, BAMS)



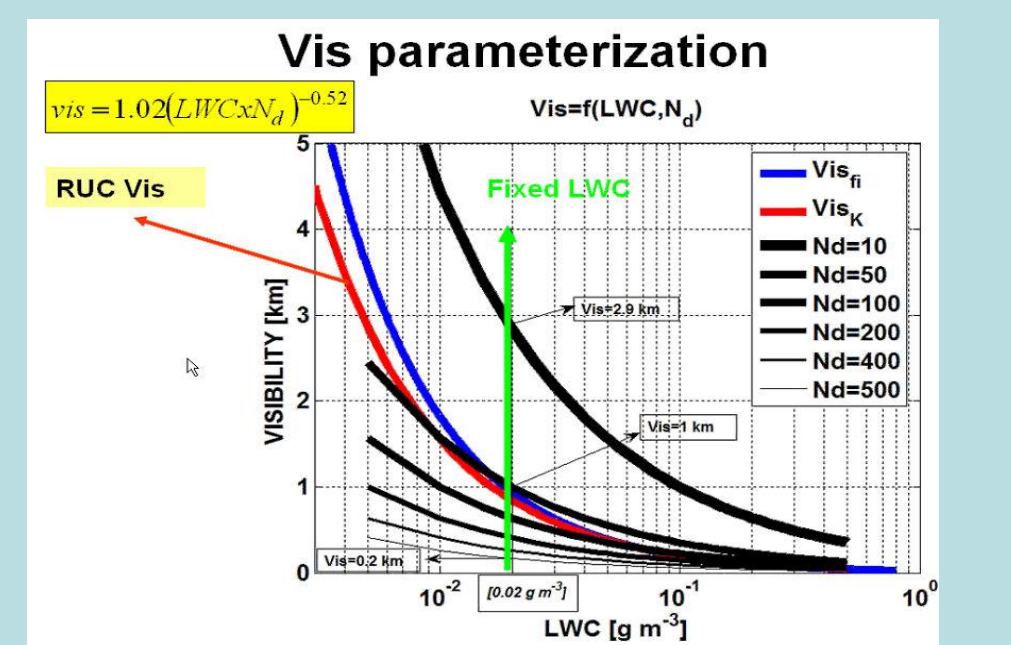
10. Regional Climate Modeling



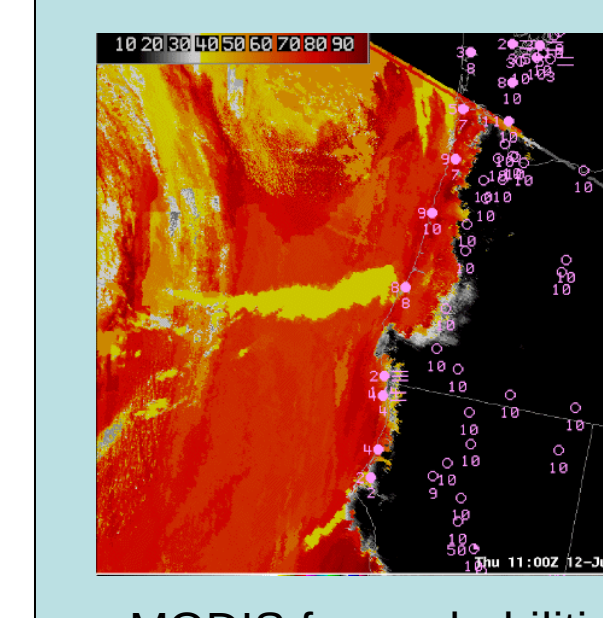
RegCM-UW (ICTP) regional climate model produces realistic fog frequency (left, compared with ship observations, right) by improving resolution, terrain, and PBL representation. (T. O'Brien (LBNL))

9. Microphysics

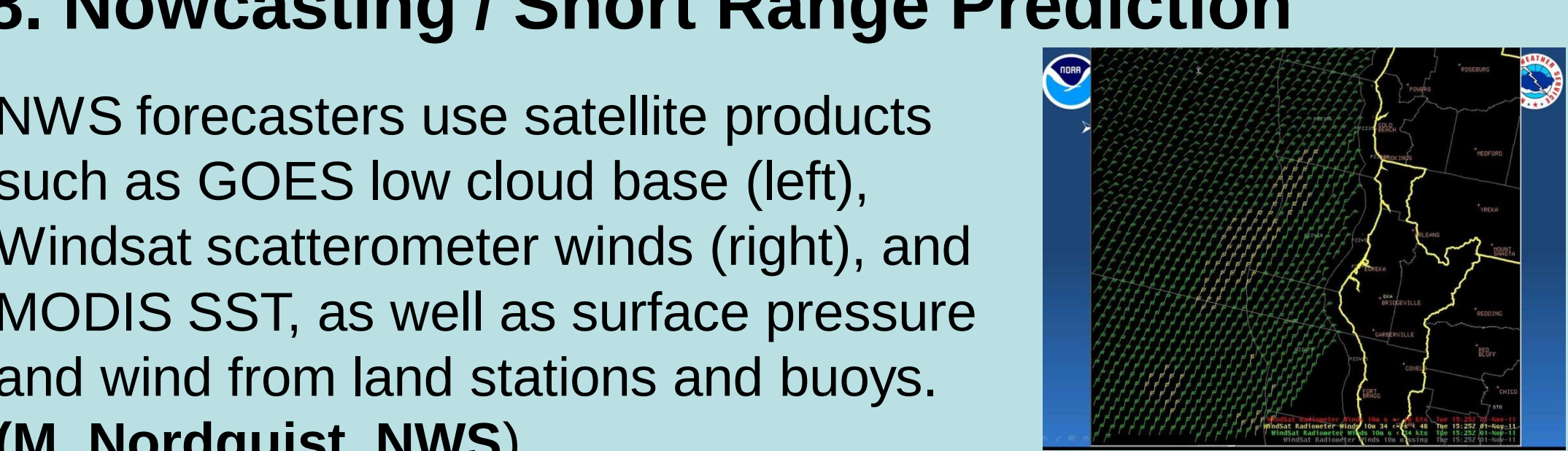
Studies at Environment Canada show that accurate forecasts of fog visibility require data on both fog droplet concentration (N_x) and Liquid Water Content (LWC) (I. Gultepe, Env. Canada)



8. Nowcasting / Short Range Prediction



MODIS fog probabilities, 1400 UTC, 11 July 2012



Windsat 10m winds on 1 Nov 2011

6. Boundary Layer Meteorology



Graphic from COMET module shows that low cloud maxima occur upwind of capes as Marine Boundary Layer (MBL) is forced to rise. Cloud minima form downwind of capes in “expansion fans” where MBL sinks. These patterns are seen in climatology panels 4 and 5 at left. Low level jet is enhanced by proximity to coastal hills leading to strong upwelling. (I. Faloona, UC-Davis)

7. Real-time Surface Data Collection

A pilot project during summer 2012 collected data from instruments donated by Env. Canada to supplement those at Bodega Bay, CA and Pepperwood Preserve for fog research and validation. (Torregrosa, USGS, I. Gultepe (Env. Canada), I. Faloona (UC-Davis), J. Underwood, (Ga. Southern U.), D. Andersen (Pepperwood))



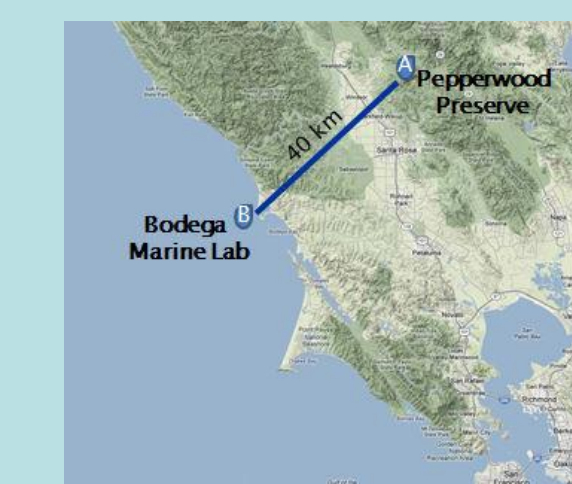
915MHz wind profiler and Radio Acoustic Sounding System (RASS)



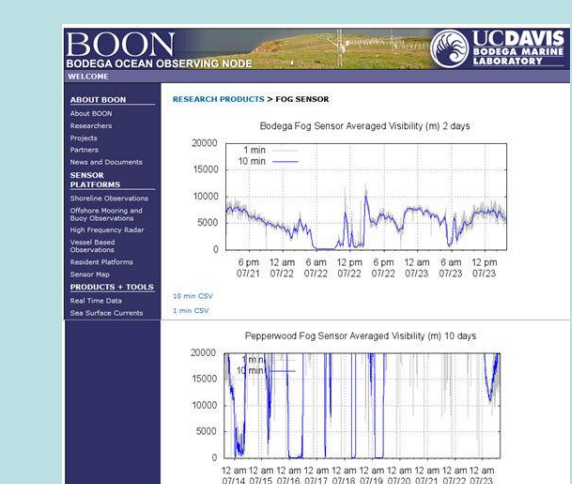
Vaisala FD12P Weather Station



Harp fog collectors



Fog instrument sites



Visibility traces for fog events



Fog Cam at Pepperwood Preserve



ASOS/AWOS/RAWS stations