

ESRL Theme Presentation on the Weather-Climate Connection

Climate Variability and Air Quality

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Presented at:

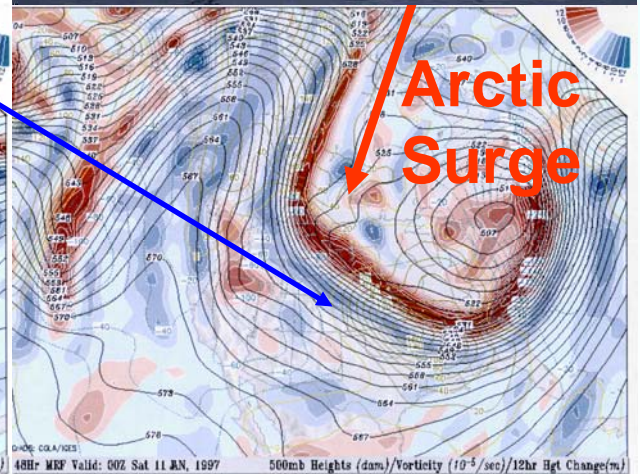
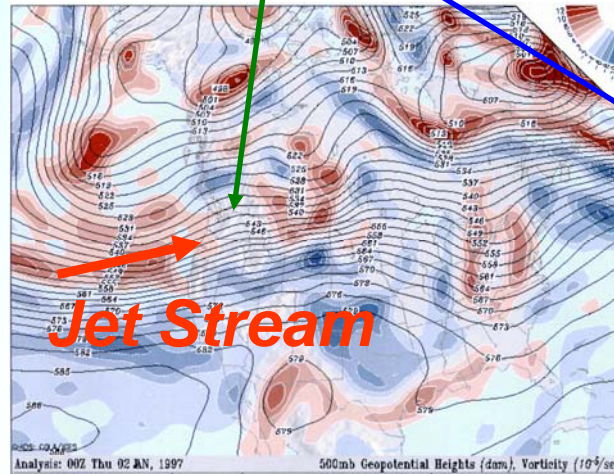
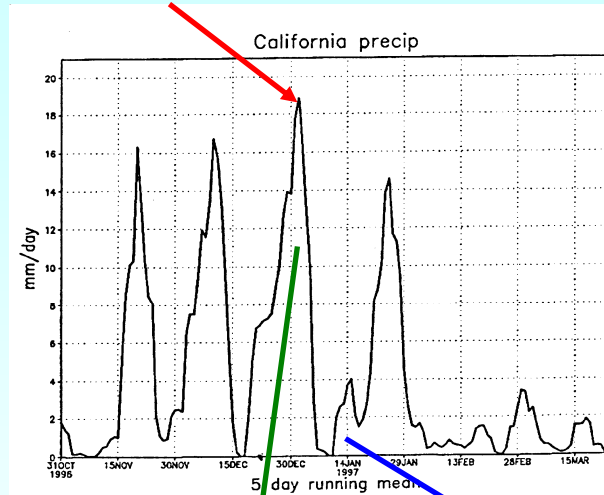
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DSRC Building, Boulder, CO: 1 November 2007



Sub-seasonal variability affects “traditional” weather phenomena as well as air quality:

Fine particle pollution in lee of the Rocky Mountains (mostly ammonium nitrate, ammonium sulfate and carbon)

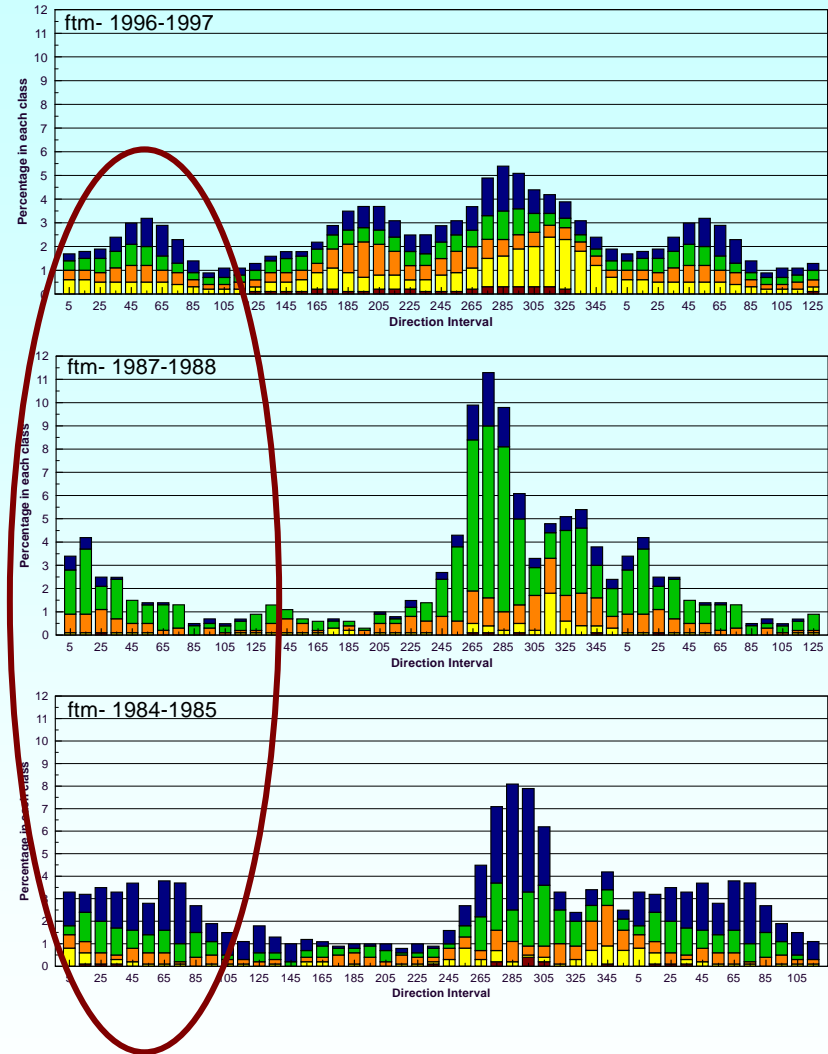
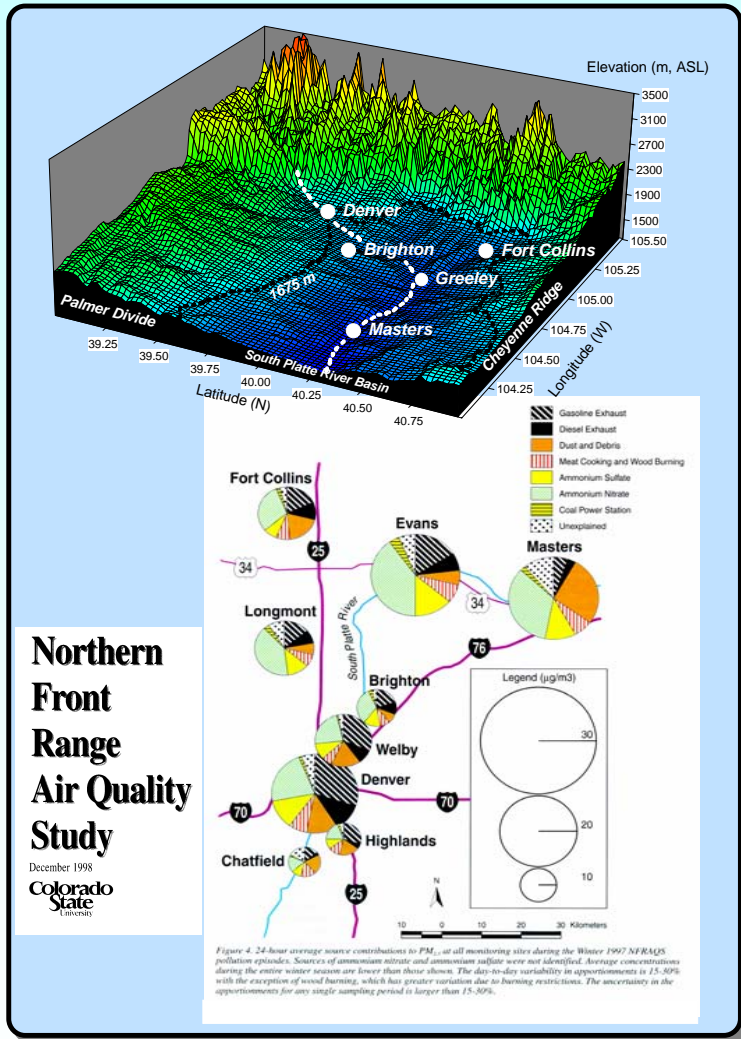
**January 1, 1997
California Floods**



00Z 2 January

00Z 11 January





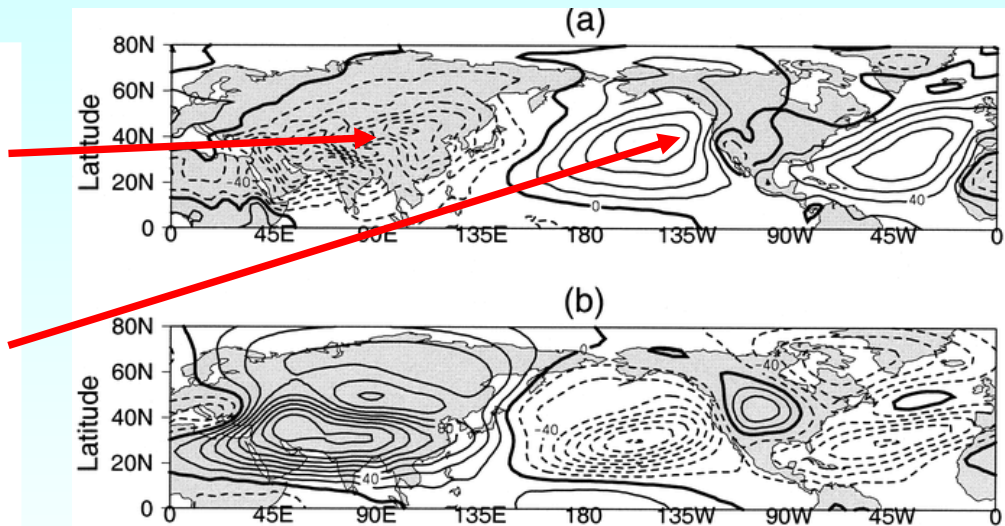
Year-to-year variability in upslope moisture events



Summer planetary wave structure presents a difficult prediction problem and may be forced by conditions far upstream

Thermal forcing over Asia creates downstream response with high pressure over the eastern Pacific: Slight shifts in this pattern affect where conditions for poor air quality occur.

In a climate change scenario, how will these patterns evolve?



July climatology (a:1000 hPa, b:150 hPa)

--Chen, Hoerling, & Dole, *JAS*, July 2001



Future challenges:

- Prediction of regional air quality changes under a climate change scenario will require an assessment of
 - Physical changes: SSTs, planetary waves, tropical forcing, ENSO to multi-decadal variability in the atmospheric circulation, extreme events (such as the enhanced Arctic Oscillation of this last winter), etc.
 - Chemical changes: changes in atmospheric composition and ancillary effects due to changing moisture and thermal regimes.
- There are challenges in our observational and modeling systems
- Predicting changes through changing seasonal cycles will present additional challenges.

