

Renewable Energy Applications and Design for the RAP and HRRR

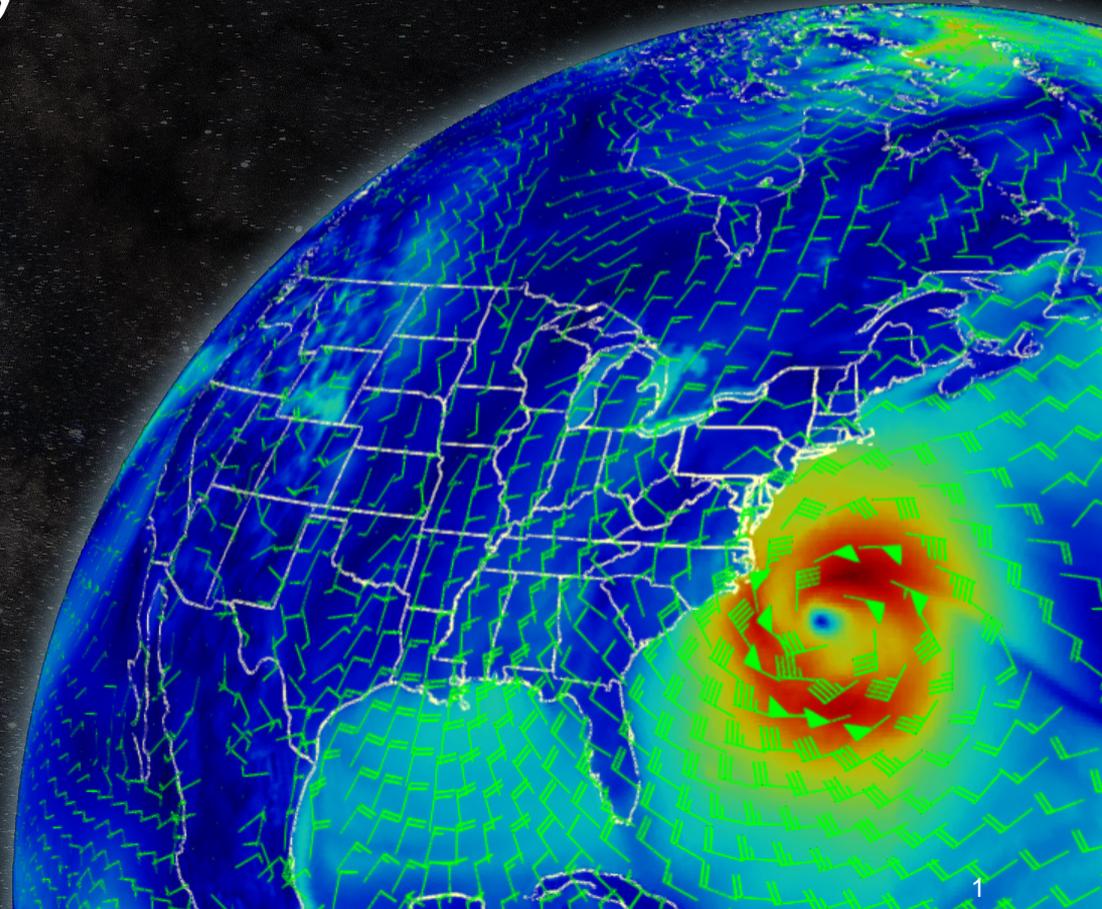
Joseph Olson

CIRES

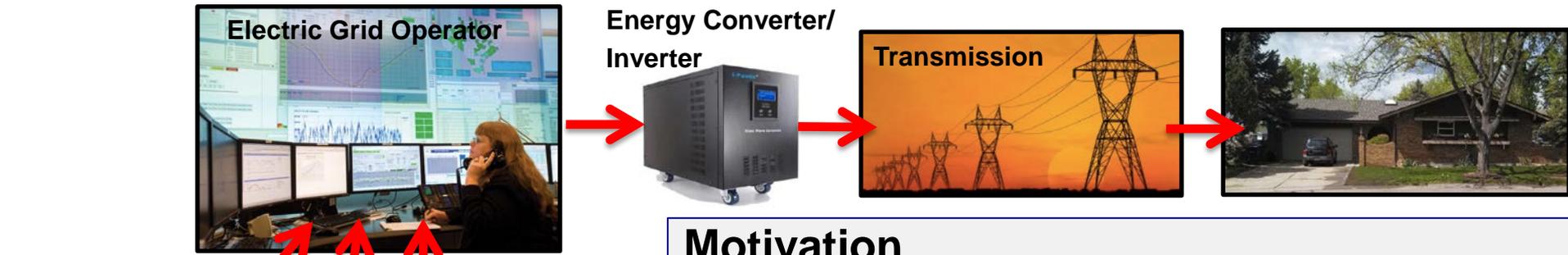
Performing work for NOAA/ESRL/GSD



GSD Science Review
3-5 Nov 2015



Renewable Energy Challenges

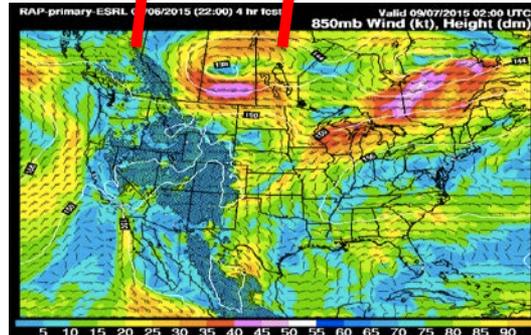


Motivation

- Wind & solar are highly variable sources of energy; grid operators *need accurate forecasts* to better integrate wind & solar energy into the electric grid

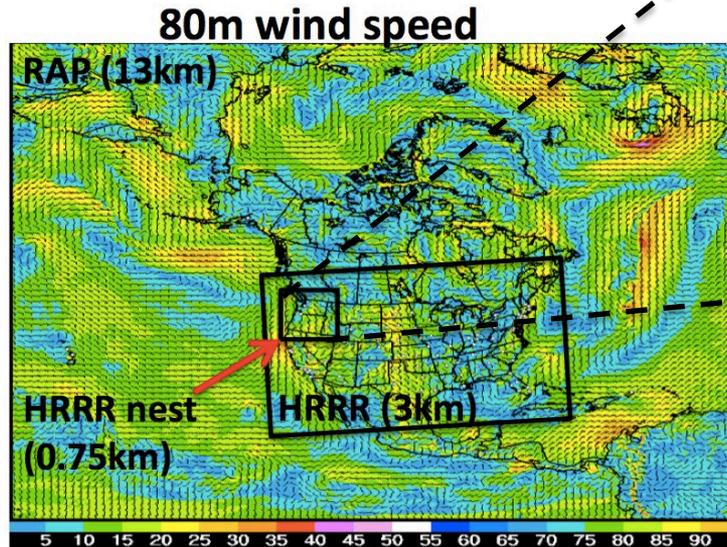
Potential benefits of improved forecasts

- Reduction of electricity costs (less penalties, less need for reserves)
- More stable/reliable electric grid
- Reduction of CO₂ emissions



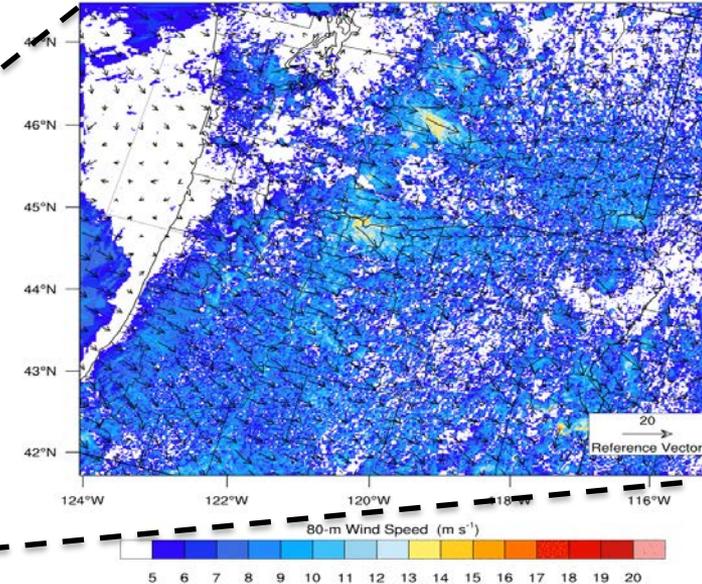
Goals for RAP/HRRR Development

- Improve our understanding of physical processes (e.g., **clouds & turbulence**) important for wind & solar energy.
- Improve representation of these processes in the RAP/HRRR parameterization schemes.
- Make model physics **scale-aware** to improve forecasts for all products/applications



HRRR nest 80m wind speed

Init: 2015-07-26_19:00:00
Valid: 2015-07-26_23:00:00

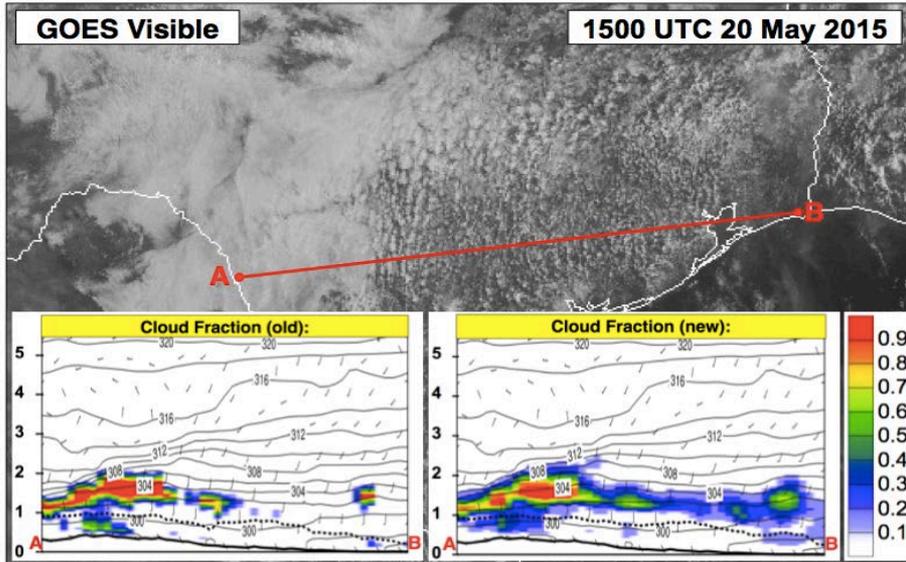


- Experimental 750-m nest being developed in Wind Forecast Improvement Project (WFIP2)
- See Melinda Marquis' poster (session 3)

Topics Presented in Poster

Improving solar (cloud) forecasts:

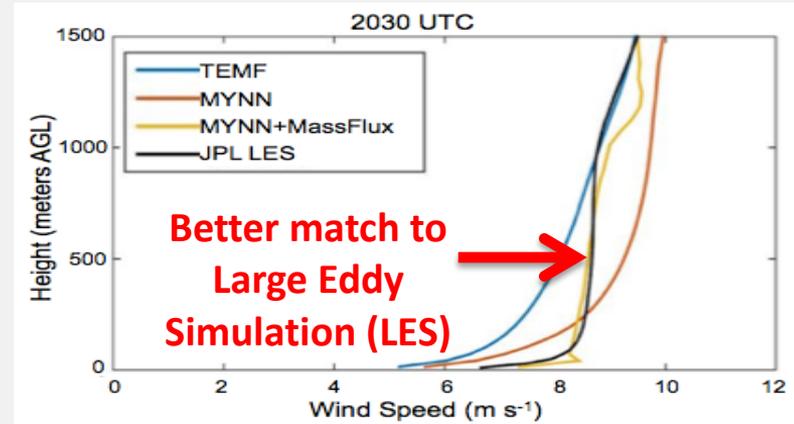
- Improved aerosol-aware microphysics and radiation physical parameterizations (in poster)
- Improved representation of unresolved stratus & shallow-cumulus (below):



Improving wind forecasts:

- Improved turbulent mixing lengths (in poster)
 - Stable PBL, scale-aware
- Improved representation of non-local mixing with addition of mass-flux scheme (below):

Results from Atmospheric Radiation Measurement (ARM) case (21 June 2006)



Please see poster for more details...