Potential Contribution to “Sochi-2014” Project: NOAA-CREST and NESDIS/STAR

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OUTLINE

• What we do

• How (we think) we can contribute to “Sochi-2014”
WHAT WE (NESDIS/STAR) DO

• Development of algorithms and operational techniques to process data from meteorological satellites

• Focus on retrieval and monitoring of environmental parameters for use in NWP, hydrological models, climate studies, specialized forecasts (e.g., flight safety), agriculture, etc.

  • Primary NOAA customers: NWS, NCEP, CPC

• Satellite sensors data used:
  - geostationary
  - polar-orbiting
    - vis/IR
    - microwave
LAND SURFACE PARAMETERS

- Surface temperature
- Vegetation cover
- Soil moisture
- Precipitation
- Snow cover
SNOW MAPPING TECHNIQUES/PRODUCTS

- Interactive
- Automated
  - vis/IR (AVHRR, SEVIRI, GOES, MODIS), 1-4 km resolution
  - Microwave (AMSU, SSMIS, AMSRE), 25-50 km resolution
  - Combined (vis/IR + microwave)

All products are derived at daily time step
Coverage is continental to global
Spatial resolution should be finer than the model grid cell size
NOAA INTERACTIVE SNOW/ICE MAPS

- Drawn interactively by human analysts
- Based primarily on satellite vis imagery
- Northern Hemisphere coverage
- Daily maps at 4 km resolution
- Plans to improve to 1 km resolution by 2012
NESDIS AUTOMATED SNOW/ICE MAP

- Completely automated technique
- Combines satellite snow retrievals in the vis/IR and in the microwave
- METOP AVHRR, GOES IMAGER, MSG SEVIRI, DMSP SSMIS
- Daily global maps at 4 km nominal resolution, (2 km by 2012)
  - 30 km effective resolution when cloudy
INTERACTIVE VS AUTOMATED

- Automated maps: more consistent time series
- Interactive maps: earlier detection of changes in snow cover
- Automated maps (green) better agree to surface observations of snow than interactive maps (blue)
- Most stations are in midlatitudes
- MSG SEVIRI: potential for mapping snow at 1 km resolution every 15 min
- Max effective spatial resolution over Black Sea region is ~2 km
- No retrievals when cloudy
- First tests in fall 2011
MODIS: IMPROVED SPATIAL RESOLUTION

- NASA (global) algorithm
- 2 times per day (Terra and Aqua)
- 500 m nominal resolution
- Discontinuity due to clouds
- Similar maps will be generated with VIIRS NPP data (launch in 2011)
MODIS SNOW MAP: 500 M

- Spatial resolution can be further improved to 250 m
SNOW TEMPERATURE

- 1 km resolution
- Helps to identify areas of snow melt
- Geo satellites: diurnal temperature change
SNOW DEPTH/SWE

- Derived from observations in the microwave (SSMIS, AMSU, AMSRE)
- Spatial resolution 25-50 km
- Large overestimation in the mountains
- Melting/shallow snow is often missed
- Retrievals are not reliable, accuracy is poor (errors of over 100%)
- Spatial resolution
  - ASTER, Landsat, 30-40 m but once in 16 days, clear sky
    - May not be available by 2014
  - MIS (microwave), 10 km by 2013

- Snow mapping algorithms can be better tuned for limited area
OUR POTENTIAL CONTRIBUTION

• Satellite-derived information on snow cover for model initialization and/or verification
  - Daily at 4 km resolution (down to 1-2 km by 2012)
  - 10 km when cloudy (by 2013)

• Higher temporal and spatial resolution snow cover data:
  - Up to 15-30 min with SEVIRI
  - Up to 250-350 m with MODIS or VIIRS
  - Clear sky scenes only

• Other satellite-based land surface products (e.g., LST, vegetation parameters, cloud cover)

• Satellite radiances for assimilation in models (IR, microwave)
THANK YOU
Instrumentations at Site

Snow depth Temperature Profiler
Total 16 Thermocouples are used
- 2 thermocouples below surface
- 1 thermocouples at Surface level
- 6 thermocouples at 2 inches interval
- 4 thermocouples at 3 inches interval
- 3 thermocouples at 4 inches interval
Preliminary Results