Application of NUCAPS for Thermodynamic Fire Weather Analysis

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Introduction

• NUCAPS in the NOAA Operational Retrieval algorithm for SNPP and NOAA-20 Advanced Baseline Imager (ABI) temperature, moisture, and trace gas retrievals.
• The JSSP Sounding Initiative developed an experimental capability for plan-view and cross-sectional displays of NUCAPS Soundings in AWIPS (i.e. Gridded NUCAPS) for the United States, Alaska, and their surroundings.
• This work was done in collaboration with the NWS Anchorage CXVIS and the Hazardous Weather Testbed.
• Gridded NUCAPS will be baselined in AWIPS 10.2.1.
• This offers a new opportunity to explore use of Gridded NUCAPS for various forecasting topics, especially in data sparse, remote areas.
• Case studies were examined to assess the utility of NUCAPS Soundings and the NUCAPS Soundings and Gridded product for fire weather potential.

Methodology

• NUCAPS data were obtained from NOAA CLASS and reformatted for AWIPS display.
• Two southern Great Plains cases and two Alaska cases were examined.
• AWIPS imagery was used to determine the residence of a low (warm thermal trough) (Linsey et al., 2017) in the Great Plains or presence of warm, dry conditions in Alaska.
• Cross-section displays of NUCAPS Soundings in AWIPS 10.2.
• For the Alaska Cases:

  • Low relative humidities from 750 mb to the surface
  • Warm temperatures at 700 mb
  • Strong, westerly winds at all levels with the vertical temperature and dew point profiles.
  • Combined ASAP Rapid Retrieval model was used to determine the relative contribution to the winds based on data from 2014 (Linsey et al., 2017).

• Alaska Cases:

  • Analyzed 800 mb and other levels for warm, dry temperatures, and significant and persistent dry conditions were identified.

• Alaska soundings which were unfavorable to use for determining the potential for large fire development and growth

Focus on 700-500 mb layer above the topography

• Assessed Haines Index which was modified to use into the data.
• Soundings were generated to show the vertical pattern for temperature and relative humidity (Fig. 18 and 19).

• The Gridded NUCAPS spatial gradients in relative humidity (Fig. 14) and 23 July (Fig. 26) and near Northway indicate a moderate potential for fire growth.
• The fire started on 10 June (Fig 25) and 11 July (Fig. 26) to 11 July (Fig. 27) by 10 June (Fig 25) and near Northway by 1025 UTC.
• The AWIPS-derived Haines Index match the GFS analysis pattern for temperature and Haines Index.
• Gridded NUCAPS 850 mb and derived fields were evident in three out of four cases, with one demonstrating low fire weather potential.

Conclusion

• Atmospheric conditions favorable to fire weather development were observable in three out of four cases, with one demonstrating low fire weather potential.
• Spatial gradients in single level, layer, and derived fields were evident in Gridded NUCAPS.
• New fields such as Haines Index and Total Precipitable Water were assessed.
• Gridded NUCAPS can be used with model data where topography limits coverage.
• NUCAPS Soundings and Gridded NUCAPS show potential for assessing the thermodynamic environment related to fire weather potential.

More Information on NUCAPS

Advanced Satellite Sounding
Foundation Course for JSSP
Gridded NUCAPS VLab page
NUCAPS Soundings Quick Guide

Gridded NUCAPS Quick Guide
OSPO NUCAPS Information
OSPO Skew-T Viewer

References


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