

A Rare Ice Storm in the Intermountain Western U.S.: Storm Morphology

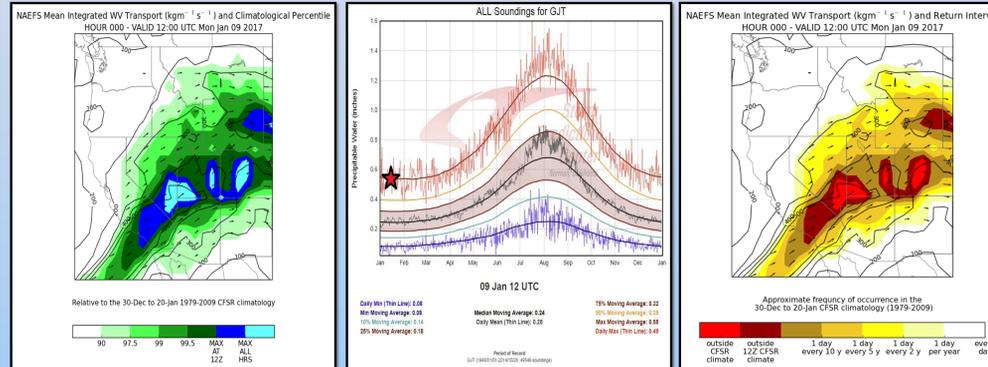


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Event Overview

- A winter storm on 09 January 2017 caused an unprecedented amount of freezing rain to fall across several valley locations in western Colorado and eastern Utah
- An atmospheric river pushed precipitable water (PW) values to over 200% of the normal climatological mean at Grand Junction, Colorado for early January
- Model performance on the depth of a warm layer aloft and cold boundary layer conditions was poor in the immediate 12 hours preceding the freezing rain event
- Low-level boundary layer conditions became favorable for freezing precipitation after clearing skies and recent snowfall enhanced temperature inversions

Strength of Atmospheric River

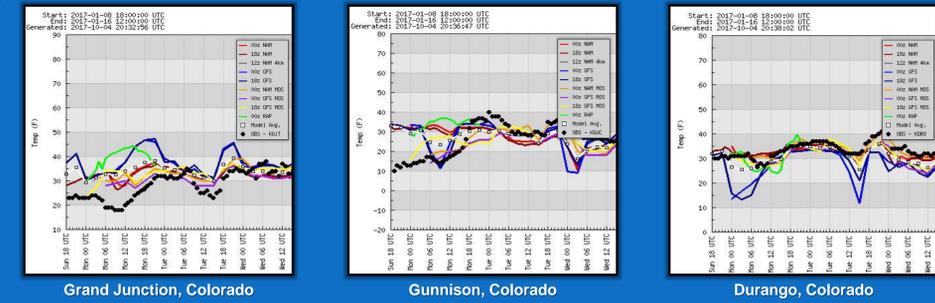


09 Jan 2017 12 UTC NAEFS mean integrated water vapor transport and climatological percentiles

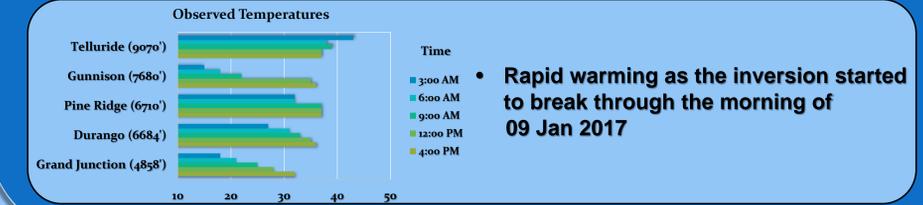
SPC sounding climatology at GJT plotting daily max PW record of 13.72 mm (0.54")

09 Jan 2017 12 UTC NAEFS mean integrated water vapor transport and return intervals

Numerical Temperature Guidance

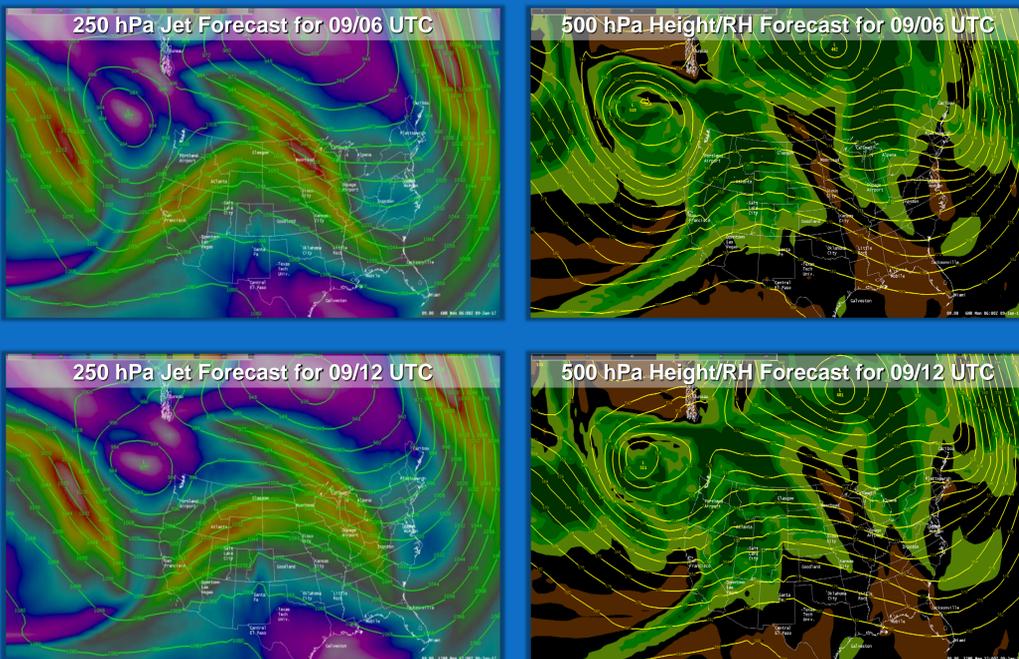


- Models struggled with the strength and duration of the temperature inversion
- Cloud and snow cover limited warming due to solar radiation



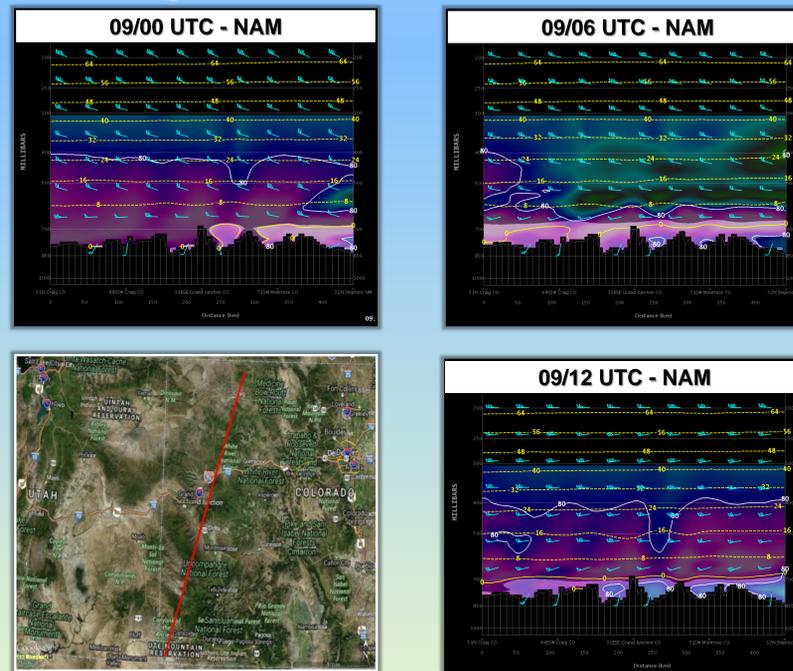
- Rapid warming as the inversion started to break through the morning of 09 Jan 2017

Forecast Storm Evolution GFS: 09 Jan 2017 00 UTC Run



Well-predicted large-scale synoptic pattern. Forecasted PW values of 10 to 15 mm (0.40 to 0.60") or 160 to 240% above the climatological normal of 6.35 mm (0.25")

Progression of Warm Air Aloft



Cross-section from Cortez northeast to Craig showing a deepening layer of warm-air aloft near 700 hPa on 09 Jan 2017

Temperature Profile Analysis

09/00 UTC GJT sounding:

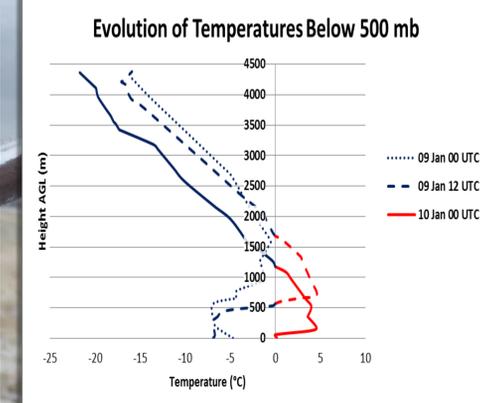
- Entire temperature profile below 0°C

09/12 UTC GJT sounding:

- 1209 m elevated warm layer
- Max temperature of 4.6°C aloft
- Using Top Down Method (east of Rockies)
 - Temperature supports freezing rain as most likely meteor type

10/00 UTC GJT sounding:

- Warm layer descended to surface



Significant Mountain Snowfall

- In addition to pockets of freezing rain, heavy snow was observed at several mountain locations across the area from 08 to 10 Jan 2017
- Generally 30 to 61 cm (1 to 2 feet) of snow fell; 122 cm (4 feet) of new snow was recorded near Crested Butte, Colorado

