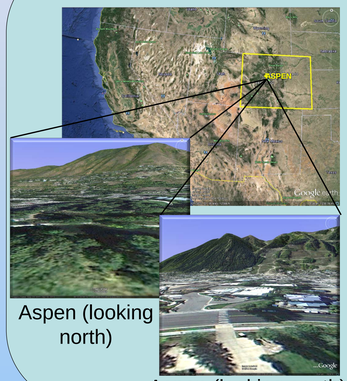
16th Conference on Mountain Meteorology, 18-22 August, 2014 San Diego, California

Intense Snowfall Rates over West Central Colorado During the Winter of 2014

Matthew D. Aleksa, J.D. Ramey Jr., M.P. Meyers
NOAA/NWS/WFO, Grand Junction, Colorado

Storm Evolution



Aspen (looking north)

Aspen (looking south)

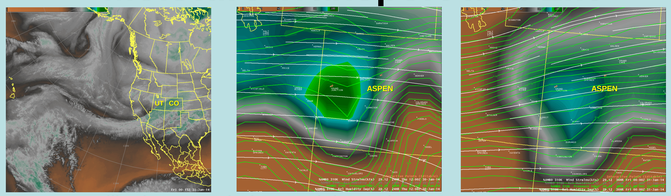
➢ A strong and moist westerly flow aided by a strong upper level jet remained across the central Rockies during 29 January – 1 February 2014.

➢ This mild winter storm created the optimal setup for significant snow and intense snowfall rates in the central Colorado mountains and valleys.

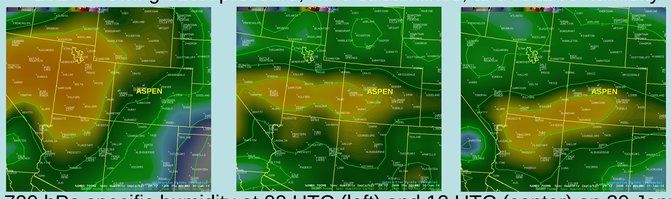
➢ Most mountain areas received 1 to 2 feet (30 to 61 cm) of snow with some central Colorado valleys receiving a foot or more. One particular location, the town of Aspen, received 24 inches (61 cm) in 24 hours and upwards of over 3 feet (91 cm) total snow during the three day period.

➢ This study will examine the storm evolution and factors that contributed to the intense snowfall rates.

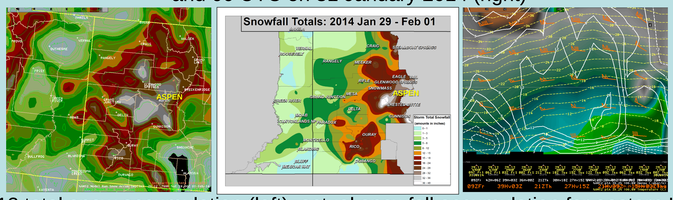
Moisture Transport and Lift



Water Vapor satellite imagery during peak intensity at 00 UTC on 31 January 2014 (left), NAM80 forecast at 12 UTC (center) on 30 January 2014 and 00 UTC (right) on 31 January 2014 showing 310K pressure, wind streamlines, and relative humidity

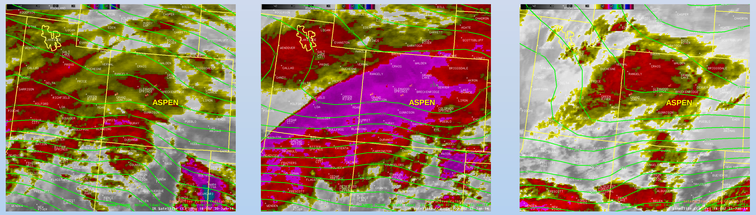


NAM80 700 hPa specific humidity at 00 UTC (left) and 12 UTC (center) on 30 January 2014, and 00 UTC on 31 January 2014 (right)



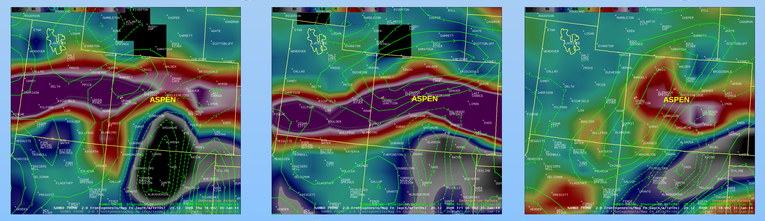
NAM12 total snow accumulation (left), actual snowfall accumulation for eastern Utah and western Colorado (center), and NAM12 time height near Aspen (right): omega (white); temperature (yellow); winds (knots); relative humidity (blue to green > 90%)

IR Satellite Imagery



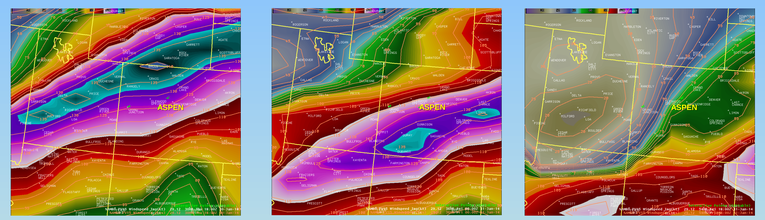
IR Satellite Imagery with NAM80 700 hPa heights (green) at 18 UTC (left) on 30 January 2014, 00 UTC (center) and 18 UTC (right) on 31 January 2014

Frontal Forcing and Upper Level Divergence



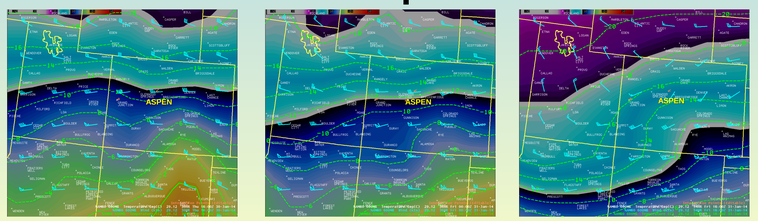
NAM80 700 hPa 2-D Frontogenesis (image) and 300 hPa Divergence (green) at 18 UTC (left) on 30 January 2014, 00 UTC (center) and 18 UTC (right) on 31 January 2014

Jet Stream Winds



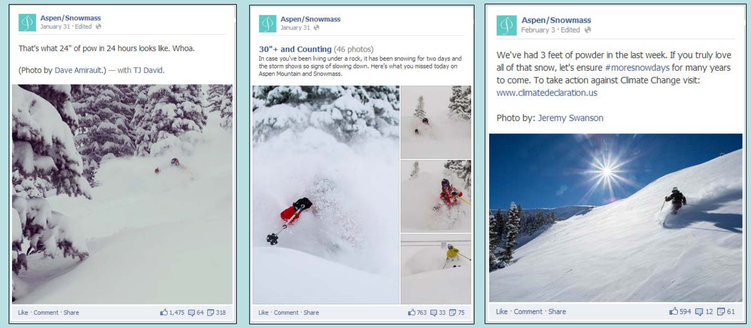
NAM80 PV1.5 (tropopause level) windspeed (image) at 18 UTC (left) on 30 January 2014, 00 UTC (center) and 18 UTC (right) on 31 January 2014

600 hPa Temperatures



NAM80 600 hPa temperatures (image) and winds at 18 UTC (left) on 30 January 2014, 00 UTC (center) and 18 UTC (right) on 31 January 2014

Social Impact



A sample of the reaction to the heavy snow accumulations and intense snowfall rates from the Aspen Mountain and Snowmass ski areas as posted on their social media Facebook page during and after the event

Conclusions

➢ Two distinct waves interacted with a strong upper level jet and moist westerly flow to produce significant snowfall of 1 to 2 feet in the mountains and some higher valleys of western Colorado. Upwards of 3 feet of snow or more fell in some locations during 29 January – 1 February 2014.

➢ One particular location, the town of Aspen, received 24 inches in 24 hours during the first wave with around 12 inches of snow with the second wave as two distinct jet streaks moved through the strong upper level jet.

➢ Sufficient moisture was in place with specific humidities ranging from 3 to 5 g/kg before and during the event.

➢ Strong vertical motion and lift acted on the moisture to produce heavy snowfall accumulations as evidenced by time heights near Aspen which showed strong vertical motion (omega) from the surface up to 300 hPa. This extended through a moist dendritic crystal growth region (-12° C to -18° C) to allow for efficient snow production.

➢ A combination of strong jet dynamics, upper level divergence and mid-level frontogenetical forcing provided the optimal setup for significant snow and intense snowfall rates among the central Colorado mountains and valleys. This forcing remained over the central corridor before pushing southeast through the rest of southern Colorado on the evening of 30 January 2014.