



Extreme Snowfall Variability in a Winter Storm over the Western Colorado Mountains



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Storm Evolution

➤ A moderate cold front and associated upper level trough tracked through western Colorado on 19-20 February 2012

➤ The storm brought widespread light to moderate snowfall to the mountains of western Colorado and eastern Utah

➤ An exception to this snowfall distribution occurred over the Park Range and the Grand Mesa of western Colorado where snowfall amounts of 20-30 inches (50-75 cm) fell over these locations

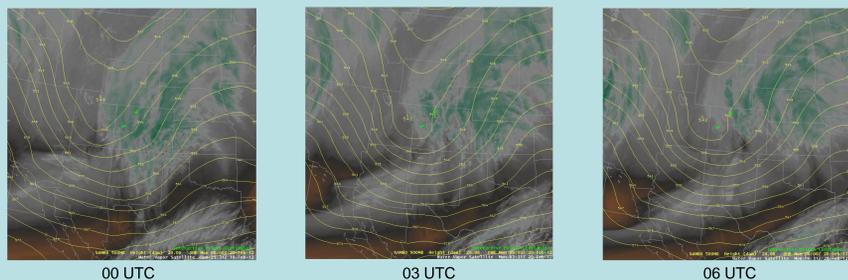
➤ This study will examine the forecast challenges of this storm detailing the storm evolution and factors that contributed to the intense snowfall rates over these localized areas and the diverse snowfall distribution that resulted from this storm



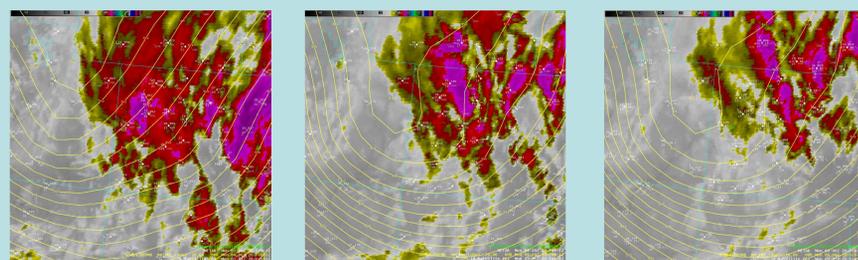
Powderhorn Mountain Resort
Steamboat Ski Resort

Satellite Observations

20 February 2012

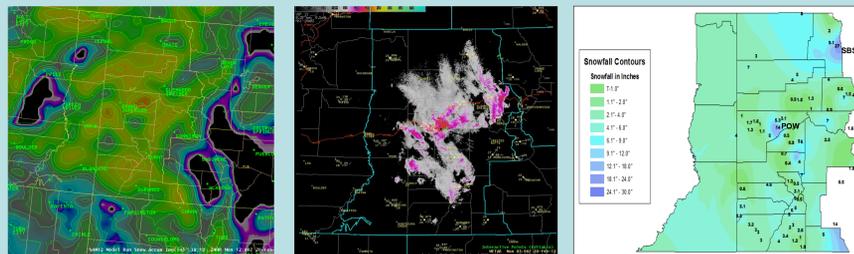


Water vapor during peak intensity



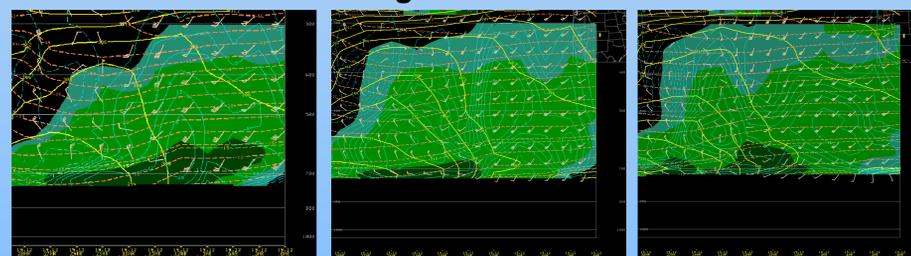
IR satellite imagery during peak intensity

Precipitation Distribution



NAM12 24 hour snow accumulation (left), 0329 UTC radar 0.5° reflectivity during peak intensity (center), and actual snowfall accumulations for western Colorado (right)

Time Height Point Forecasts



Potential temperature (Yellow), relative humidity imaged (dark green >90%), winds (knots), temperature °C and -15 °C isotherm representing dendritic crystal regime Powderhorn Resort (left), Sunlight Resort (center) and Steamboat Resort (right)

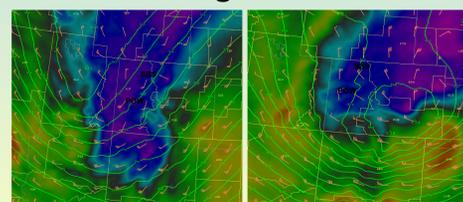
Q Vector Forcing and Isentropic Lift



NAM80 forecast at 00 UTC (left), and 06 UTC (center) on 20 February 2012, showing Q-Vectors, Div-Q, and lapse rates

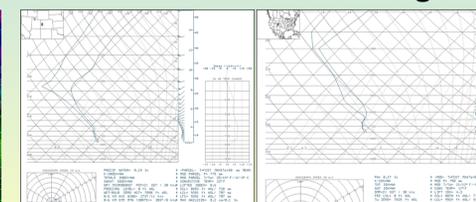
GFS40 forecast at 00 UTC (right) on 20 February 2012, showing 305K pressure, wind streamlines, and potential temperature

700 hPa Heights and Winds



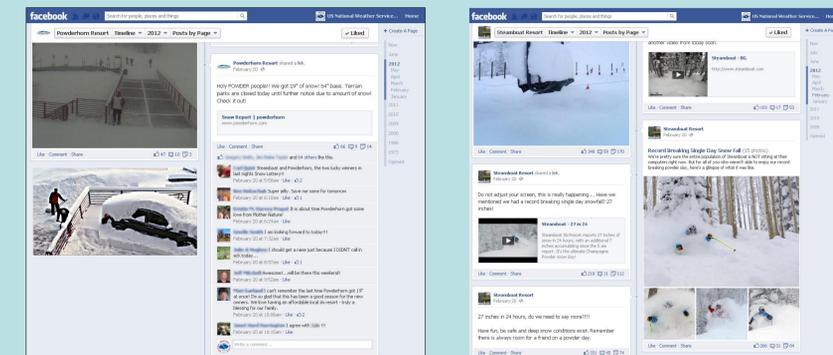
NAM12 forecast for 12 and 24 hours 700 hPa winds in knots, RH is imaged

RUC Forecast Soundings



Forecast valid 06 UTC on 20 February 2012 Powderhorn (left) and Steamboat (right)

Social Impact



Small sample of the reaction to the heavy snowfall on the social media site Facebook from the Powderhorn (left) and Steamboat Springs (right) ski areas

Conclusions

- Deepening vigorous trough passed over the region on 19-20 February 2012 bringing widespread snowfall
- Strong dynamical lift as indicated by Q-Vectors, satellite, and potential vorticity (not shown) impacted much of northwestern Colorado
- Release of potential instability in combination with strong dynamical and frontal lift resulted in snowfall rates of 3 to 5 inches (8 to 13 cm) per hour in the Steamboat area
- Localized enhanced snowfall occurred due to prolonged saturated uplift in the critical dendritic crystal growth region (-12 to -18° C) over the Powderhorn Mountain Resort and Steamboat Ski areas but not evident at Sunlight Mountain Resort or the Aspen or Vail areas farther east
- Moist northwest flow behind the front favored moderate to heavy snowfall along all northwest-facing slopes overnight

