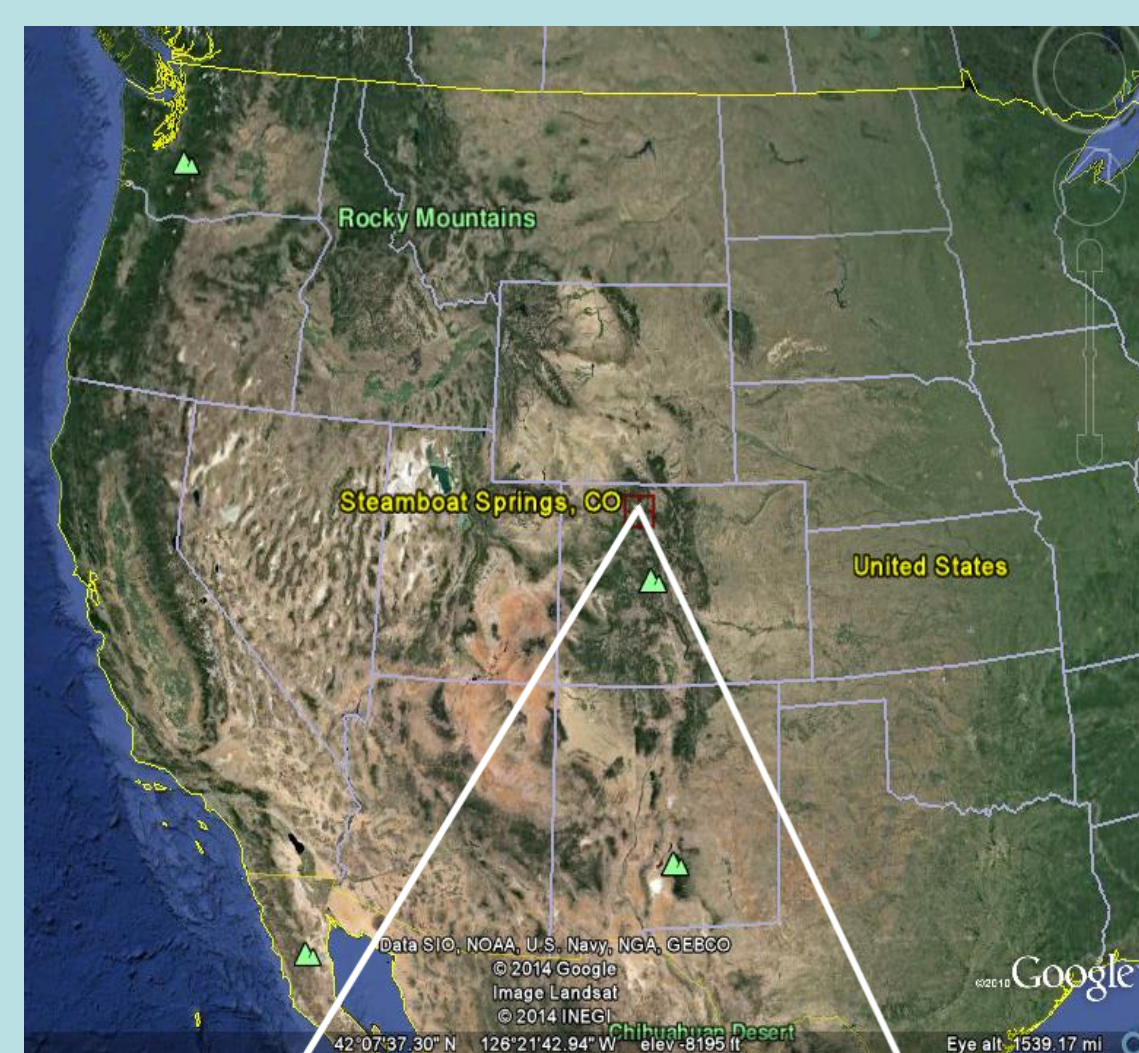
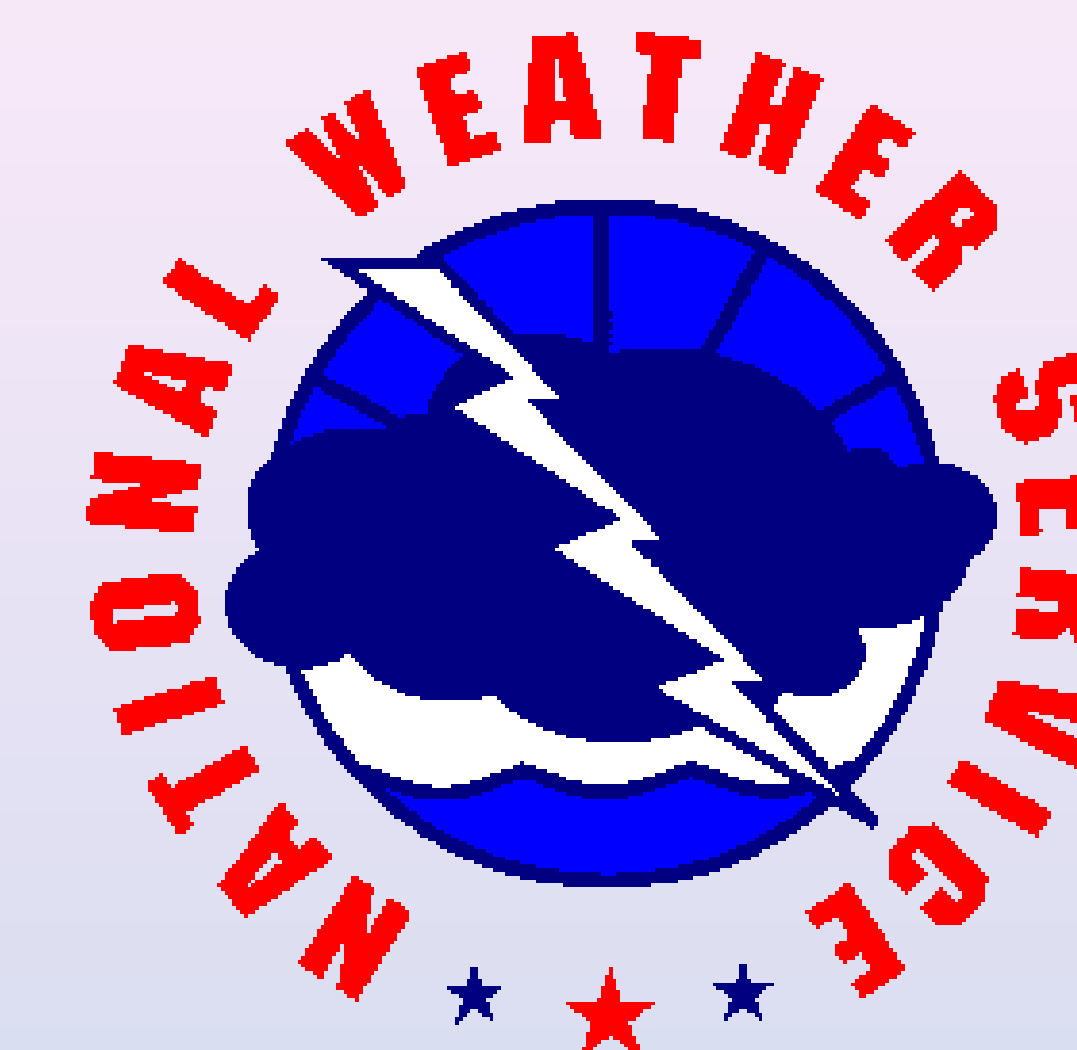




The Steamboat Springs Smoke-out: April 15, 2010

M.T. Booth, J.D. Colton, M.P. Meyers
NOAA/NWS/WFO, Grand Junction, Colorado



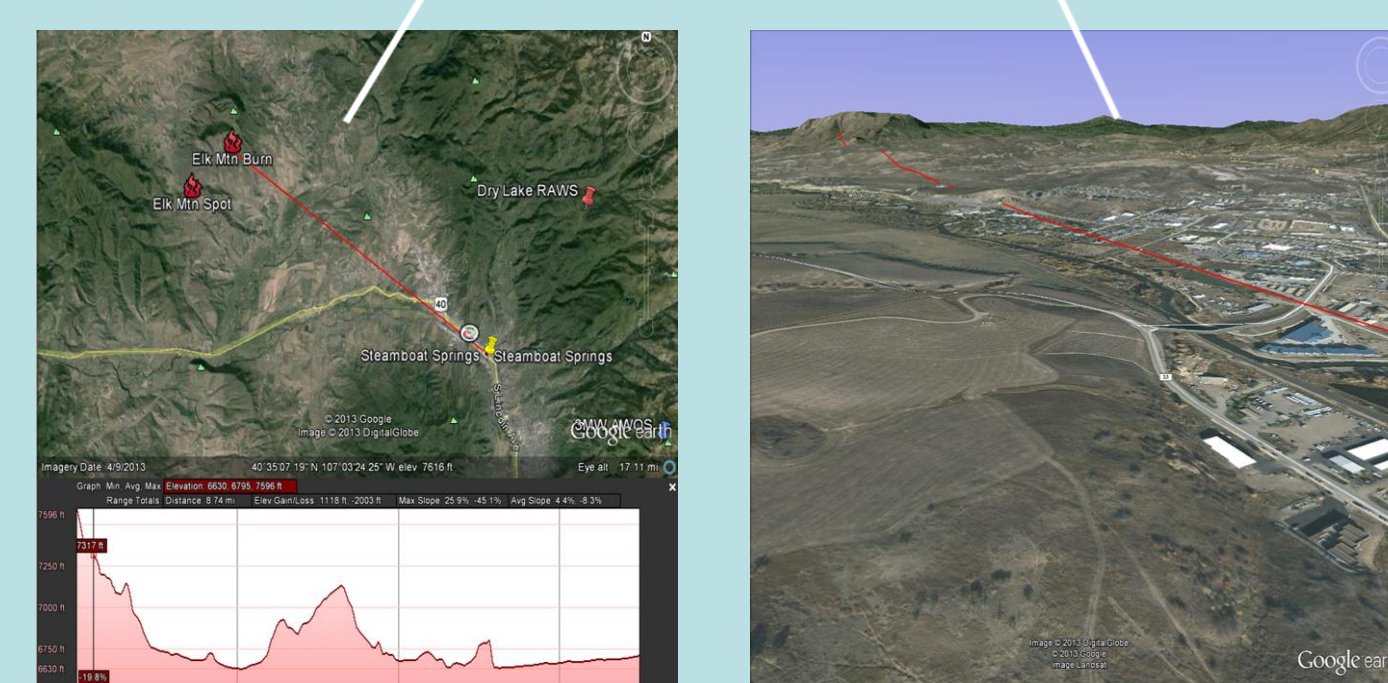
Introduction

➤ A controlled burn was conducted on Elk Mountain about 15 km northwest of Steamboat Springs Colorado on 15 April 2010.

➤ Preliminary forecasts indicated favorable mixing and smoke dispersal would be available along with southwest transport winds to advect smoke north of the town of Steamboat.

➤ Environmental conditions changed during the afternoon shifting the smoke plume in an easterly direction with smoke impacts in Steamboat Springs.

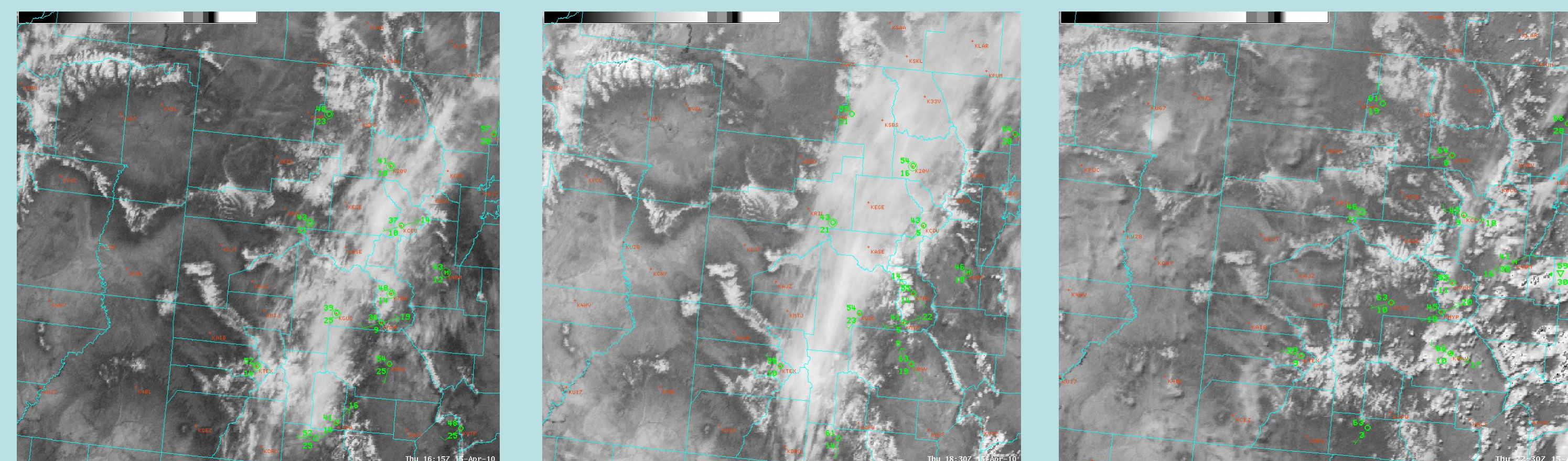
➤ This study will examine the primary meteorological factors that allowed smoke to overtake the town of Steamboat Springs due to the control burn.



Elk Mountain Burn + Steamboat Springs

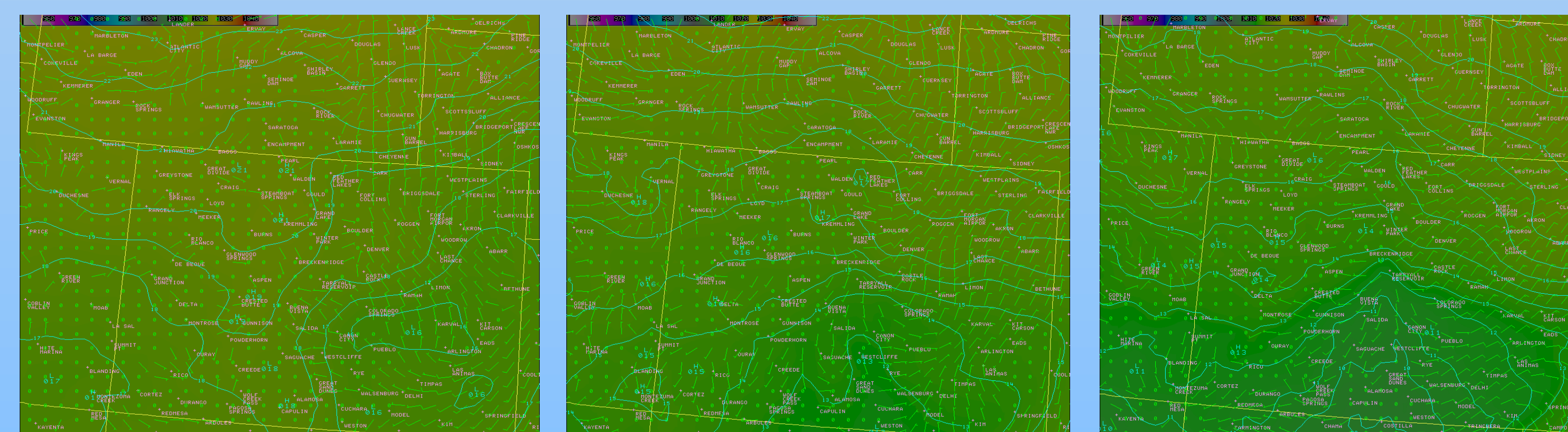
Looking toward Elk Mountain from Steamboat Springs

Visible Satellite Progression



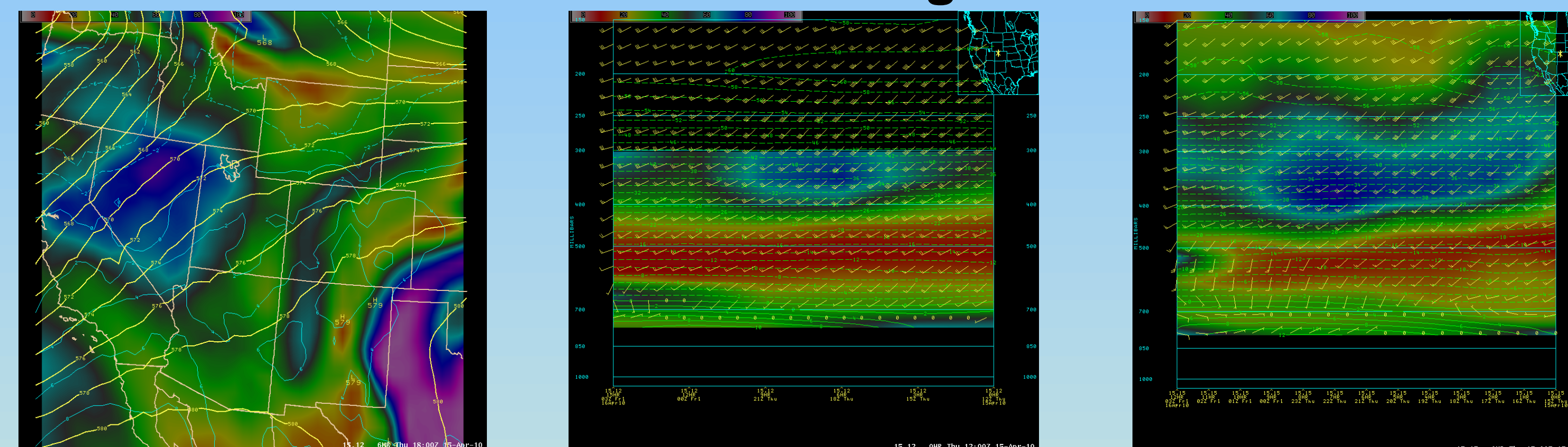
Visible Satellite: 1615 UTC (left), 1830 UTC (center), and 2230 UTC (right).

Surface Winds and MSLP Forecasts



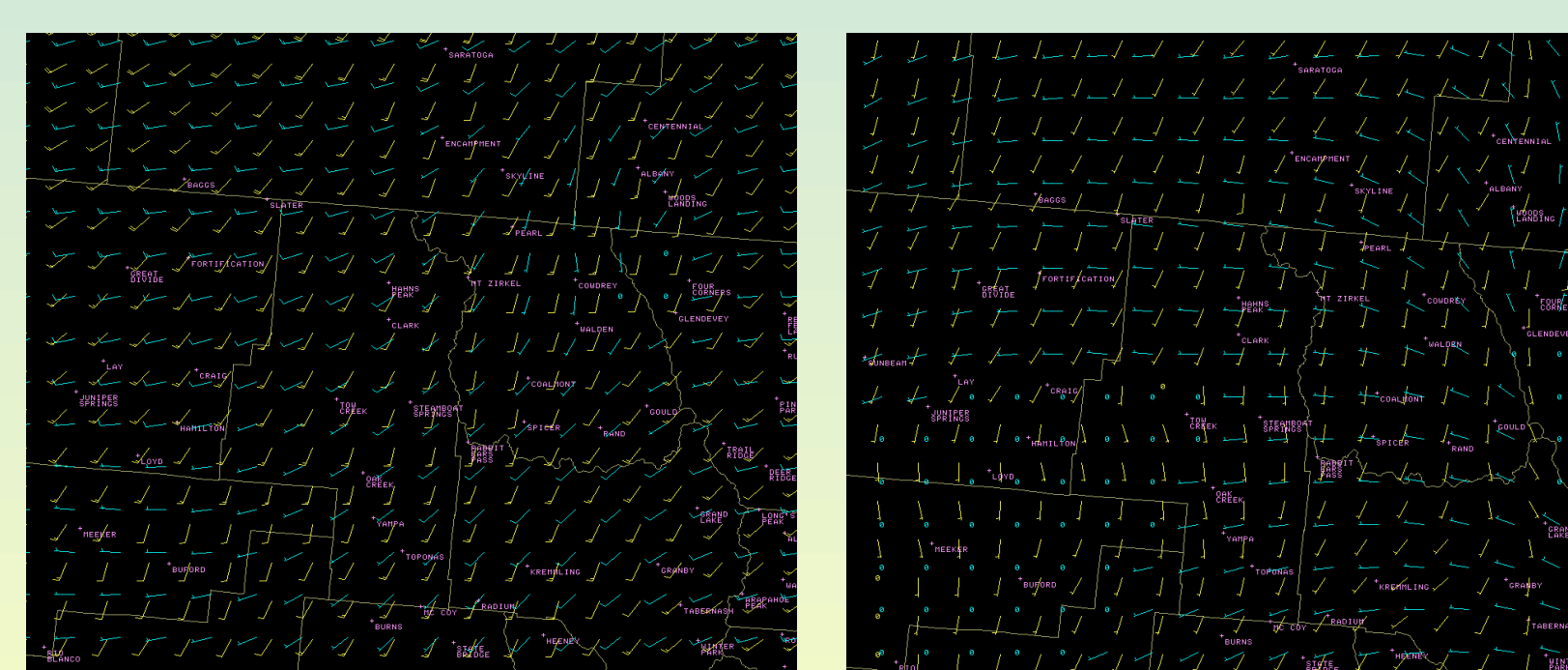
NAM12 surface winds (light green), mean surface level pressure imaged and contoured (hPa), 15 UTC (left), 18 UTC (center) and 21 UTC (right)

General Pattern and Time Height Point Forecasts



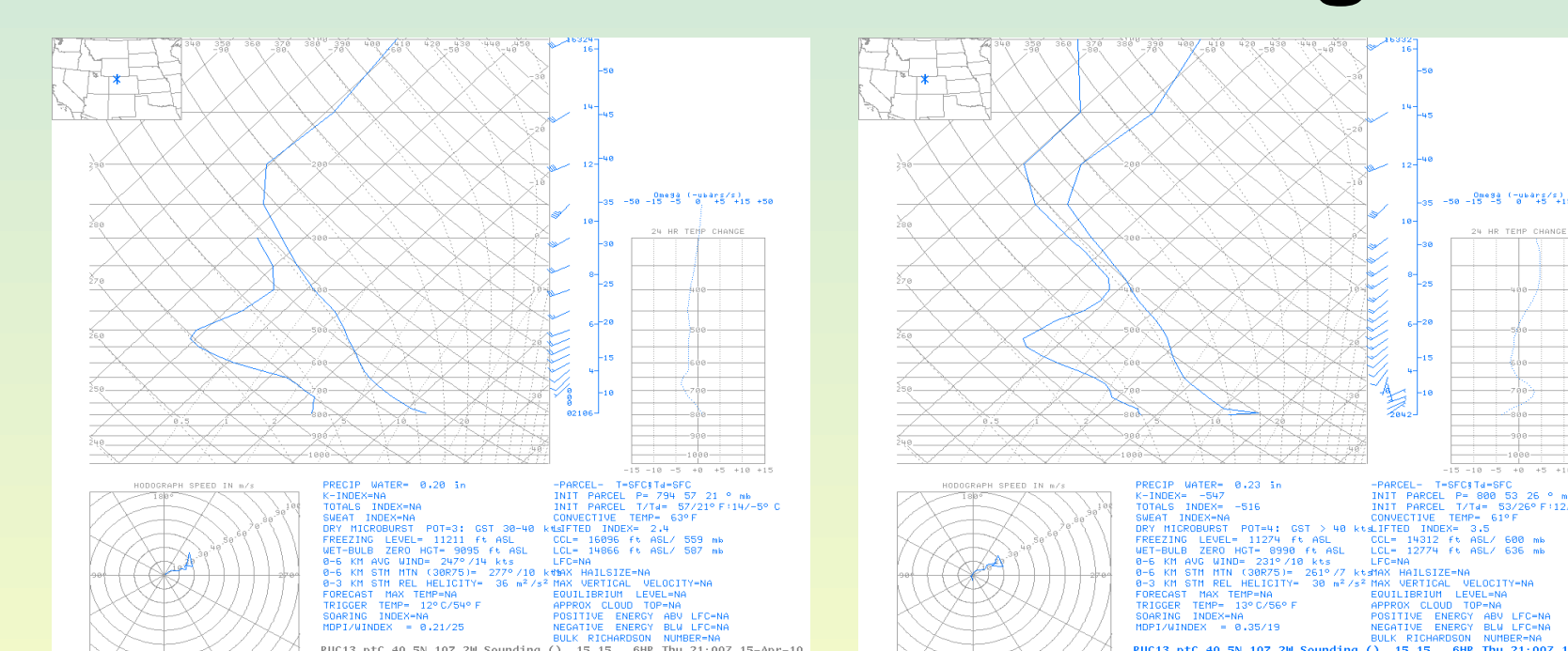
GFS40 forecast at 18 UTC (left) on 15 April 2010, showing 500 hPa heights (yellow), 700 hPa temperatures (cyan in °C), and 300-500 hPa RH (imaged). NAM12 (center) and RUC13 (right) forecast time heights at Elk Mountain burn site RH (imaged), winds (yellow), and temperatures (green)

600 hPa vs 675 hPa Winds



RUC13 (cyan) and NAM12 (yellow) wind forecast comparison at 21 UTC for the 600 hPa and 675 hPa levels

NAM and RUC Soundings



Forecast valid 21 UTC on 15 April 2010 NAM12 (left) and RUC13 (right)

Social Impact

Controlled burn fills valley with smoke

By Pilot & Today staff
Friday, April 16, 2010

Steamboat Springs — A previously planned controlled burn on Elk Mountain caused smoke and haze in and around Steamboat Springs on Thursday afternoon.

The burn is finished, BLM spokesman David Boyd said. The Bureau of Land Management's Little Snake Field Office handled the 725-acre prescribed burn on Elk Mountain, also known as Sleeping Giant. The goal of the burn was to reduce built-up fuels and improve wildlife habitat on the southern side of the mountain, according to the BLM.

When the BLM prepares for a prescribed burn, it gets a "spot weather forecast," which is specific to the burn area, Boyd said. The forecast Thursday for the Elk Mountain burn showed winds coming from the southwest. At about 3:30 p.m., he said, the winds started coming from the north.

"At that point, at 3:30, they were already done igniting, so that was smoke that was already in the air," Boyd said about the smoke that headed for Steamboat. "So that was something that wasn't anticipated."

He said people with respiratory problems should consider staying inside if the air is smoky.



Small sample of the reaction to the smoke "filling the valley" from the Steamboat Pilot.
Photo Credit: Colorado Air Quality

Conclusions

➤ Weak ridging brought light winds, above seasonal temperatures, and fair skies to much of western Colorado on 15 April 2010.

➤ Surface high pressure over central Wyoming during the morning hours pushed a subtle cold front into northwest Colorado bringing unanticipated low-level northwesterly winds.

➤ Enhanced high cloud cover over the burn site during peak heating along with weak warm air advection between 500-700 hPa, limited the mixing height to near 675 hPa (based on available photos).

➤ Estimated winds at 675 hPa were west-northwest (toward Steamboat Springs) but southwesterly (away from Steamboat Springs) at 600 hPa, which was the initial forecast mixing height. This lower mixing height lead to transport winds from the west or northwest, rather than the forecast of southwest.

➤ The combination of the northwest surface winds, reduced mixing due to abundant high cloud cover, and westerly transport winds due to the resultant lower mixing height allowed smoke from the Elk Mountain prescribed burn to filter into the town of Steamboat Springs for several hours late on 15 April 2010.



Smoke Plume Progression



1831 UTC 1953 UTC 2054 UTC

Top photos looking northwest at Elk Mountain burn.



2157 UTC 0113 UTC 0118 UTC

Bottom photos taken from in and around Steamboat Springs.

Photo credit: Colorado Air Quality