

Attachment

Section 1.3 Stratospheric Ozone Intrusion: On page 4, the guidance provides a description of the isentropic potential vorticity (IPV) as a ‘tracer’ for stratospheric intrusion. This is correct; however, we suggest that the following sentence:

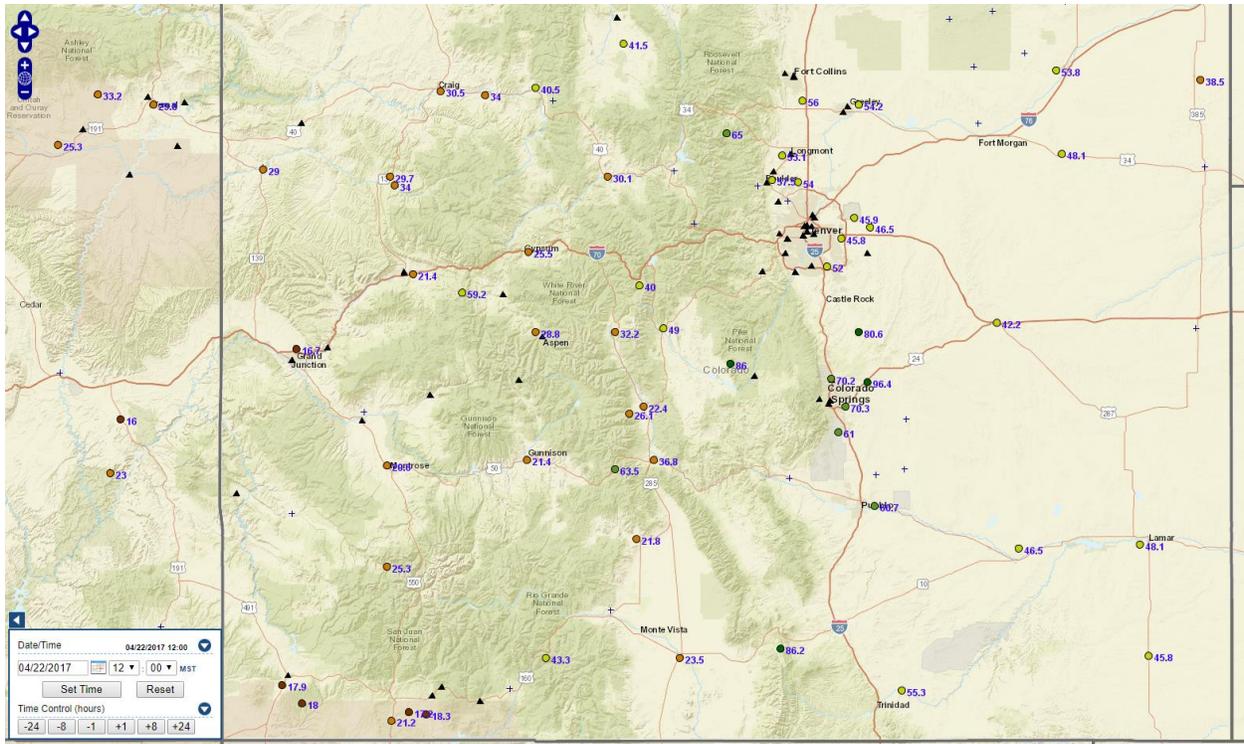
“IPV refers to atmospheric spin, which, for stratospheric air, is much higher than for tropospheric air and does not change as it mixes to the surface during intrusions.”

be changed to:

“IPV, for stratospheric air, is much higher than for tropospheric air and does not change as it mixes to the surface during intrusions.”

IPV is defined as the product of atmospheric spin (vorticity) and gradient of potential temperature over atmospheric pressure, and therefore the statement that “IPV refers to atmospheric spin” is only partially correct.

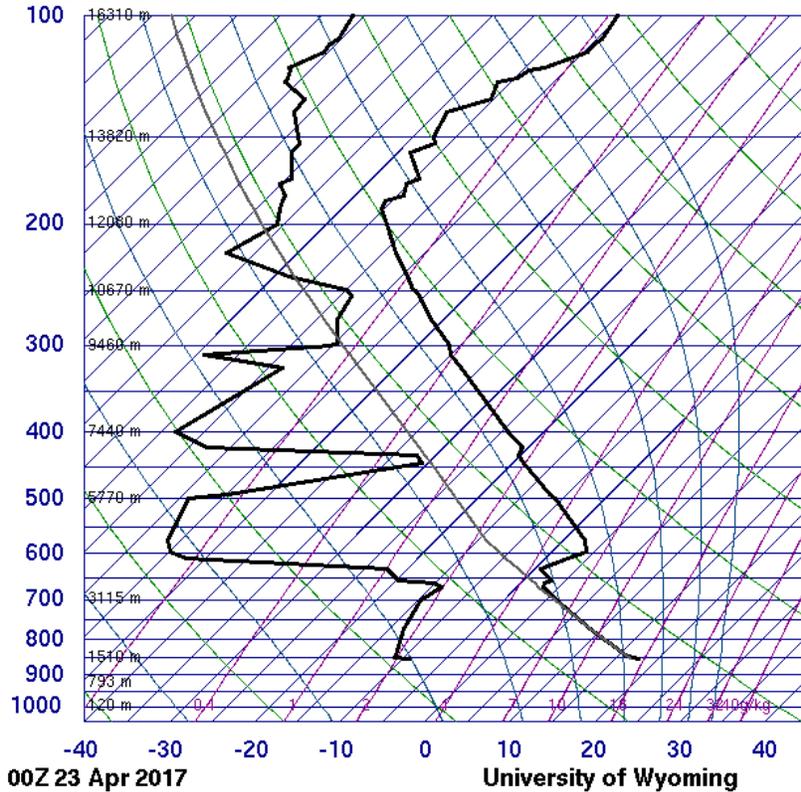
Section 3.4.1 Event Overview: Near the end of the first bulleted paragraph on page 15, it is stated, “Surface dew point values ranged from 15-20 degrees F on the morning of the exceedance day, indicating very dry air had moved into the region.” This statement is in reference to Figure 4a, which shows surface observations. Indeed, with consideration *including* the surface air temperature in the 55-65 degree F range (as seen in the figure), dew points of 10-15 degrees do indicate dry air. However, this is not clearly stated in the text. Dew point temperatures only indicate the temperature that air would need to be cooled to, from the observed temperature and moisture characteristics that it has, in order to reach saturation. Reporting dew point temperatures alone cannot give an assessment of the moisture content of the air (an air mass with a temperature of 18 degrees and a dew point of 10-15 degrees still fits this statement, but indicates quite moist air, not dry air). Here, relative humidity (likely the most familiar assessment of humidity to most people) or dew point depression could be used instead of just dew point temperature, or the statement could simply be clarified. It is also noted that the statement refers to this data as ‘on the morning of the exceedance day,’ and the map shows observations at 18Z, which is noon local time, so perhaps simply stating as ‘on the exceedance day’ is more fitting. The statement currently reads, “Surface dew point values ranged from 15-20 degrees F on the morning of the exceedance day, indicating very dry air had moved into the region.” We suggest wording similar to: “Surface relative humidity values ranged generally between 20-30% on the exceedance day, indicating very dry air had moved into the region. A surface temperature of 53 degrees F and a dewpoint temperature of 10 degrees F, as is shown in southwestern Colorado in Figure 4a, indicates a relative humidity of 17.5%.” Below is a screenshot from the AirNow Navigator showing relative humidity observations of the values of reference. We suggest that this image, or one similar to it, be used in addition to the current figure if the suggested wording is to be used.



Section 3.4.3 Analyses showing Stratospheric Air Reached the Surface: In the first paragraph, it is stated, “Many stratospheric intrusions influence the FT but are prevented from reaching the surface due to stable conditions promoted by subsidence inversions or nocturnal boundary layers.” While this is true, these are not the only things that can prevent an intrusion from reaching the surface. For clarity, this statement should be rephrased and should refer to these features as examples of things that can prevent surface influence - not as the only things that prevent it, as it seems with the current wording.

Section 3.4.3 Analyses showing Stratospheric Air Reached the Surface: The dry layer depicted in Figures 6a and 6b shows the presence of a dry layer in the soundings. It is also noted that the lowering of the dry layer indicates stratospheric influence, and points to the low level ‘approximately dry-adiabatic’ lapse rate as promoting deep mixing, conducive to allowing surface influence of stratospheric ozone. All of this is true; however, the afternoon sounding (00Z) that is referred to here is from 00Z on the 22nd, or 6 p.m. local time on the day prior to the exceedance. The 00Z sounding on the day following the exceedance (00Z on 23 April is 6 p.m. local time on the 22nd) will better support this statement, and provides even more evidence that the dry layer continued to be present, descending in altitude, and may have influenced the surface at the time of the exceedance. This sounding should be used (or even all three soundings showing the persistence of this feature) and would make this aspect of the justification more valid. See the sounding below from 00Z on 23 April, 2017.

72476 GJT Grand Junction



SLAT	39.11
SLON	-108.53
SELV	1475.
SHOW	11.27
LIFT	11.62
LFTV	11.43
SWET	33.99
KINX	0.90
CTOT	-0.10
VTOT	27.90
TOTL	27.80
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EGTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	256.7
LCLP	556.3
MLTH	303.5
MLMR	1.92
THCK	5650.
PWAT	4.47

Wording:

Section 3.4.1 Event Overview: Near the middle of the second bulleted paragraph on page 15, it is stated, “There are several suitable formats for these types of plots, but in many cases the primary objective would be to show that a substantial trough of low pressure, with an associated jet streak, existed upwind or directly over the site in question.” While this statement is valid and justified, it was pointed out that the features in the referenced plot (Figure 4b) were neither (strictly) ‘up wind’ nor ‘directly over the site in question.’ Because Figure 4b does not conform to the desired location(s) that are stated in the text we suggest rephrasing this statement to read something like: “There are several suitable formats for these types of plots, but in many cases the primary objective would be to show that a substantial trough of low pressure, with associated features, such as a jet streak, cold front, or well developed cyclone, was sufficiently close to the site in question to promote a mechanism of stratosphere-troposphere exchange. Often, these features exist upwind or directly over site in question.”

Section 3.4.2 Analyses Showing Stratospheric –Tropospheric Exchange: In the second bulleted paragraph, as well as in the caption for Figure 5b, the term ‘total ozone column data’ is used. This is not incorrect; however, typically this is referred to as ‘total column ozone data.’

The units are missing from both color bars in Figure 5c. Also, the caption for Figure 5c refers to the plot as a ‘plain view (top).’ This is typically referred to as a ‘plan view’, as in a floor plan, or

as Wikipedia describes a ‘plan view’: ...projection of a 3-dimensional object from the position of a horizontal plane through the object. ... a section viewed from the top... Basically, a plan view is just another name for the top view of a 3D object. This is a better description of the plot.

Section 3.4.4 Air quality analyses showing the impact of the intrusion at the surface: In the third bulleted paragraph of the section, which describes variables that could be included in a “matching day” comparison in an analysis, ‘upper air temperature [such as at the 850 or 500 hPa height]’ is suggested. Because the actual height of these pressure levels changes day to day, we suggest replacing ‘height’ with ‘level’ in this statement.