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Atmospheric Measurement Techniques Discussions

Interactive comment on "Forecast indices from ground-based microwave radiometer for operational meteorology" *by* D. Cimini et al.

Anonymous Referee #2

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While this paper was very well written and seemed to accomplish its goal of demonstrating the utility of alternate sources of weather forecast indices, there is at least one significant change to the analysis that needs to be completed prior to its publication as a peer-reviewed contribution to the scientific literature.

Much of the analysis of the correlation between radiosonde-derived and microwave radiometer profiler (MWRP) –based forecast indices (FI) centers around the K index. This is not an index that sees widespread operational use. At least in the United States (where I am most familiar with forecast procedures), it's been long since surpassed by other indices that take into account information from many more levels of the atmosphere.

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The K index requires only five pieces of information: the temperatures at 850, 700, and 500 hPa and the dew point temperatures at 850 and 700 hPa. In terms of data required, this is possibly the simplest severe weather forecast index that there is; even the computationally simpler lifted index (LI) requires multiple observations in the surface layer in order to characterize a surface-based parcel.

An index that is used far more prevalently is the Convective Available Potential Energy. This index has the advantage of being a vertically integrated parameter that takes into account the state of the atmosphere throughout the depth of parcel ascent. It also has the advantage of being a physical parameter: the vertically integrated buoyant energy associated with a parcel make much more intuitive sense than adding some dew point values to an environmental lapse rate.

However, the radiometer did not do a good job of recreating the CAPE values observed by the radiosonde, with correlation coefficients much less for CAPE than for the other FI. I would assume that this is due to the integrated nature of CAPE and the fact that the vertical resolution of the MWRP-derived profile means I am concerned about the lack of analysis for such an important parameter, one at which the forecasters using operational MWRP-derived FI would be constantly looking. Although the results would not be as promising from the perspective of encouraging radiometer use for operational forecasting, there would be of greater use to the forecasting community.

Furthermore, there was no discussion of convective inhibition (CIN) which is more important to operational forecasting than many of the indices presented.

In addition, there needs to be some discussion about why the 1-DVAR retrievals outperformed the others when it comes to FI values as compared to radiosondes. As stated on p. 6978, the upper-tropospheric observations depend primarily on the NWP output. However, what role did the radiosondes have in calculating the NWP output? Are the 1-DVAR retrievals really the best as compared to the sondes? Instead, are they merely the ones that have the most influence from the radiosonde, in which case

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the similarity in retrievals would be expected? This point needs to be addressed prirot claiming that 1-DVAR outperforms the others.

Minor concerns:

p. 6974, line 25: Wagner et al. (2008) delve into the topic of infrared-derived FI and high temporal resolution observations of FI with greater depth than Feltz and Mecikalski (2002):

Wagner, T. J., W. F. Feltz, and S. A. Ackerman, 2008: The temporal evolution of convective indices in storm-producing environments, Wea. Forecasting, 23, 786-794.

Tables 2 and 3: Due to the substantial differences in magnitude between the various FI, it is difficult to ascertain which FI are best captured by the MWRP. It would be extremely helpful if an appropriate statistical measure were normalized by the mean value of the FI to give a percentage error.

Technical corrections:

p. 6972, line 25. Commercial microwave radiometer profilers, not radiometers profilers

p. 6975, line 6. Delete the word few, or say “a few additional FI.”

p. 6975, line 21. radiosondes experience some errors, not suffer of some error sources.

p. 6977, line 13. It has already been stated that the software is proprietary. It doesn’t need to be stated again.

p. 6980, line 17. The observatory was already referred to by its German name on page 6978 (line 12). Here it is referred to with an English name. The names should be consistent.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 6971, 2014.