

Baidar et al

Using Optimal Estimation to retrieve winds.....

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Major Revision and then acceptance

General

This work uses lidar observations based on VAD and VADoe methods and compare the results with radiosonde observations. VAD technique is well known for many years. Optimal estimation (OE) is a new technique for wind analysis and claimed to be better than VAD alone. VADoe advantage is to have full covariance analysis at each level improve the wind profiles. It is claim that OE technique provide wind data at the levels where classical VAD not but uncertainty is very high. It is suggested that new method is better than old one and provided data without having any instrument hardware changes.

Major issues

Overall, what is claimed to be can be useful but with large uncertainty; this means the results can have very large uncertainty at the higher levels. If you compare the figs 5 and 6, as well as 4, you can see what is going at higher levels.

Ln 29; Gultepe et al 2018 A review on aviation meteorology.... PAAG) can be provided here.

Ln37/60; seems these parags should be given under the method section. Intro is very short if these parags are taken to another section. Intro should be developed into a better summary of earlier obs/issues.

Fig. 4; how can we say the retrieval (middle) provided better results compared to radiosonde; I see the strikes in the retrievals. VAD shows nothing. How can say that retrievals are better?

Fig 5; Compare VAD versus OE; OE shows much larger scatter of the data points compared to VAD ones. Then how can we say OE led to better results compared to VAD?

Fig. 6; OE shows better results (a) but with large uncertainties (Fig. 5). Sd for both methods are bad at higher levels any way. Again issues exist at higher levels and OE technique provides bad results (higher error) but VAD provides no results. Based on this can we use OE results accurately? Probably not. Say if wind speed 2 m s^{-1} and error is 4 m s^{-1} , then why we have to use this data?

Fig 5 and 6; how many data points are used in the analysis and how data is averaged? Please provide some info in the captions of Fig5 and 6.

Please do a Discussion section before the Conclusions. Then discuss the issues mentioned above.

Conclusions:

- please provide a description of VAD technique, and what assumptions used?
- What equation is used in VAD? What was the vertical air motion at the surface? Zero? Right? Was it correct?
-with correlations of 0.998 and 0.999 between the VADtrad and VADoe for u and v, respectively? Is this correct? If they are 100% correlated, it means no difference between 2 methods, then why we need OE technique? This can't be correct because OE provided large uncertainty compared to VAD when compared to radiosonde. Why is that?
- Results represent what? 1 day or 6 months? Also why not provide a few extreme cases?
- Ln353/354 is this correct? Please provide the conclusions with bullets..