Atmos. Chem. Phys. Discuss., 12, C10845–C10848, 2012
www.atmos-chem-phys-discuss.net/12/C10845/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Preliminary signs of the initiation of deep convection by GNSS" *by* H. Brenot et al.

Anonymous Referee #2

Received and published: 20 December 2012

Overview The paper "Preliminary signs of the initiation of deep convection by GNSS" by Brenot et al. Studies ZTD gradients from a network of GNSS receivers over Belgium with the goal of improving near real-time forecasting of convective initiation. This study is definitely worth pursuing with regards convective initiation and nowcasting, however there are a number of problems with the methodology and with the scientific language used in this paper which must be addressed prior to publication.

Major Comments to the Authors There is a lack of quantification throughout the paper and the reader has to depend on vaguely expressed qualitative terms e.g. humidity and instability – these need to be quantified in terms of relative humidity, water vapour or CAPE or something else. Additionally there are a number of non-scientific terms used in the paper such as 'water vapour bubbles' and 'neutrosphere' which should be

replaced with more accepted scientific terminology.

There is no assessment of error with respect to decreasing the observation time interval for calculating ZTD or gradients, that is, how much error is introduced in ZTD and gradient values with 15 minute data intervals as opposed to longer intervals (or smaller intervals, e.g., 5 minutes)? This, I suppose, will become even more important when using real time predicted orbits. And, as mentioned above, the error associated with real time predicted orbits needs to be estimated.

Due to the fact that this study was done in a post-processing fashion, in its current state it has little real relevance to nowcasting. The study needs to be conducted again using IGU products (predicted half of the IGS Ultra rapid products) which would give a true reflection of the products which could be derived for near real-time applications. One idea would be to study how much worse the ZTDs and ZTD gradients are using IGU products vs. IGS Final products.

More information needs to be given with regards to calculating the ZTD gradients – this is not entirely clear. Also, the orbits used for calculation should've been mentioned earlier in the paper.

From the paper it is clear to me that the gradients add little to the overall study and it is the convergence of water vapour fields (as observed in the ZTD) which are of most benefit to predicting convective initiation. As such I would propose looking at the data again and only looking at ZTD or IWV fields and their flux as precursors. Ideally the advected component due to winds would be removed so you are only measuring the ZTD/IWV change in the same parcel of air, and not just if a parcel of air with higher ZTD has been transported into the cone of observation

Specific Comments and Technical Issues. P. 20352 Line 12. If the baselines were 5-30km maybe a higher elevation cut-off should've been used so that the observations were more from overhead Line 20 Define 'mean' meteorological observation Lines 21. "first order" and "second order" need to be defined – expand.

ACPD

12, C10845–C10848, 2012

P. 20353 Line 5. Change ‘forerunners’ to a more meteorological term Line 7. Change ‘GNSS gradients of delay’ to ‘GNSS delay gradients’

P. 20354 Line 1. Change ‘wet’ and ‘invaded’ to more descriptive terms Line 9. Define ‘clusters’ Line 14. Change ‘downpours’ to maybe ‘heavy precipitation’ Line 17. Need to give more information about ALADIN NWP model Line 22. Change ‘GNSS has been used to characterise the humidity field’ to ‘GNSS networks have been used to characterise horizontal humidity fields’

P. 20355 Line 8. Change ‘MET’ to ‘meteorological’ if that’s what is meant here. This whole sentence is a little vague and should be reworded. Lines 16-18. This needs to be clarified – more information on processing method is needed Line 23. ‘Bi-frequencial’ should be changed to ‘dual frequency’

P. 20356 Line 14. ‘amplitude 2 times over mean amplitude’ is a bit confusing – needs to be clarified Line 20. ‘neutrosphere’ should be changed to ‘neutral atmosphere’

P. 20357 Line 9. ‘water vapour bubbles’ should be changed to a more meteorological term Lines 24+35 – with such a dense GNSS network in Belgium, maybe a higher elevation cut-off angle could’ve been used so observations were more overhead

P. 20358 Line 5. ‘are equivalent to the humidity field’ – not true, they are ‘proportional to’ maybe... Line 22 ‘strong activity’ this needs to be defined

P. 20359 Line 10. What is meant by Digital Counts? This needs to be defined or replaced with another more common term Line 14 – suggest to remove ‘the weather office of’ – not needed, sentence is fine without it Line 21 – again DC is referred to, same comment as above.

P. 20360 Line 15. ‘bubble ot humidity’ should be replaced with a more meteorological term Line 16 – ‘dipole’ maybe changed to ‘gradient’? Line 21 Cloud formation is a sink of humidity, humidity does not increase with could formation. Sentence needs rewording

ACPD

12, C10845–C10848, 2012

Interactive Comment

P. 20362 Line 4. ‘humidity’ and ‘instability’ need to be defined in terms of relative humidity or water vapour and/or CAPE etc

P. 20363 Line 4. ‘neutrosphere’ should be replaced with ‘neutral atmosphere’ Line 23. ‘GNSS delay variations are driven by humidity variations and integrated water vapour’ – these are essentially the same thing are they not ?

P. 20364 Line 1 ‘substantial decrease of ZTD followed by a strong increase of ZTD’ – this needs to be defined – by how much? What are the criteria used for an alert? Line 17. ZTD gradients have not added anything to detecting convective initiation, it is ZTD flux/differences which have given this information

---

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 20351, 2012.

ACPD

12, C10845–C10848, 2012

Interactive Comment