Response to Reviewers – "Complementarity of Wind Measurements from Co-located X-band Weather Radar and Doppler Lidar"

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Community comment from Sebastian Kauczok: Bias in Doppler Velocity due to Insect Migration

Dear authors,

Throughout your contribution you treat insects as proper and unproblematic targets for Doppler weather radar wind velocity measurements. There is neither a discussion of the potential bias in velocity due to migratory behaviour of insects, nor a verification that this is not the case in your data set. It is known in the literature that special heed needs to be payed, if insects are acceptable as a target or not for the application at hand. In the latter case, insects need to be filtered out (see [1] and [2], for example). For example, the German Weather Service operates X-Band Doppler weather radar/Doppler Lidar combinations at Frankfurt and Munich airport. Their observations reveal that differences between Doppler velocities from radar and lidar are unacceptable, if insects are not filtered out, since this leads, inter alia, to false wind shear alerts. [3]

[1] Rennie, S.J.: "Doppler weather radar in Australia.", CAWCR Technical Report No. 055, 2012

[2] Hannesen, R., S. Kauczok, and A. Weipert: "Quality of clear-air radar radial velocity data: Do insects matter?" 8th European Conference on Radar in Meteorology and Hydrology, Garmisch-Partenkirchen, Germany. 2014

[3] B. Stiller, German Weather Service, personal communication, 2013

Reply to community comment from Sebastian Kauczok

We thank the author for the comment and pointing out a considerable shortcoming in the analysis presented in the manuscript. To investigate the issue whether insects are biased scatterers for the radar, we added a scatterplot (Fig. 9 in manuscript) to Section 4.3 that contains only measurements where the X-band radar has $Z_{\mathrm{DR}} \geq 5$ and $\rho_{\mathrm{HV}} \leq 0.9$, as those measurements would be expected to be from insects. For this subset of the data, the coefficient of determination $R^2 = 0.95$ is slightly decreased and bias (ME $= 0.078\,\mathrm{m\,s^{-1}}$) increased, but the RMSD $= 1.13\,\mathrm{m\,s^{-1}}$ is decreased. Visually, the artefacts seen in Fig. 3 are not present in the new scatterplot. This leads us to conclude that for our location and data, insects are not an issue when comparing Doppler

velocity measurements from lidar and radar. However, this is certainly not the case everywhere, so the issue should be investigated separately for each location.

We have added discussion summarizing the above in Section 4.3 and in the conclusions in Section 5. Additionally, we added discussion of dual-PRF unfolding errors as an error source in Section 4.1.

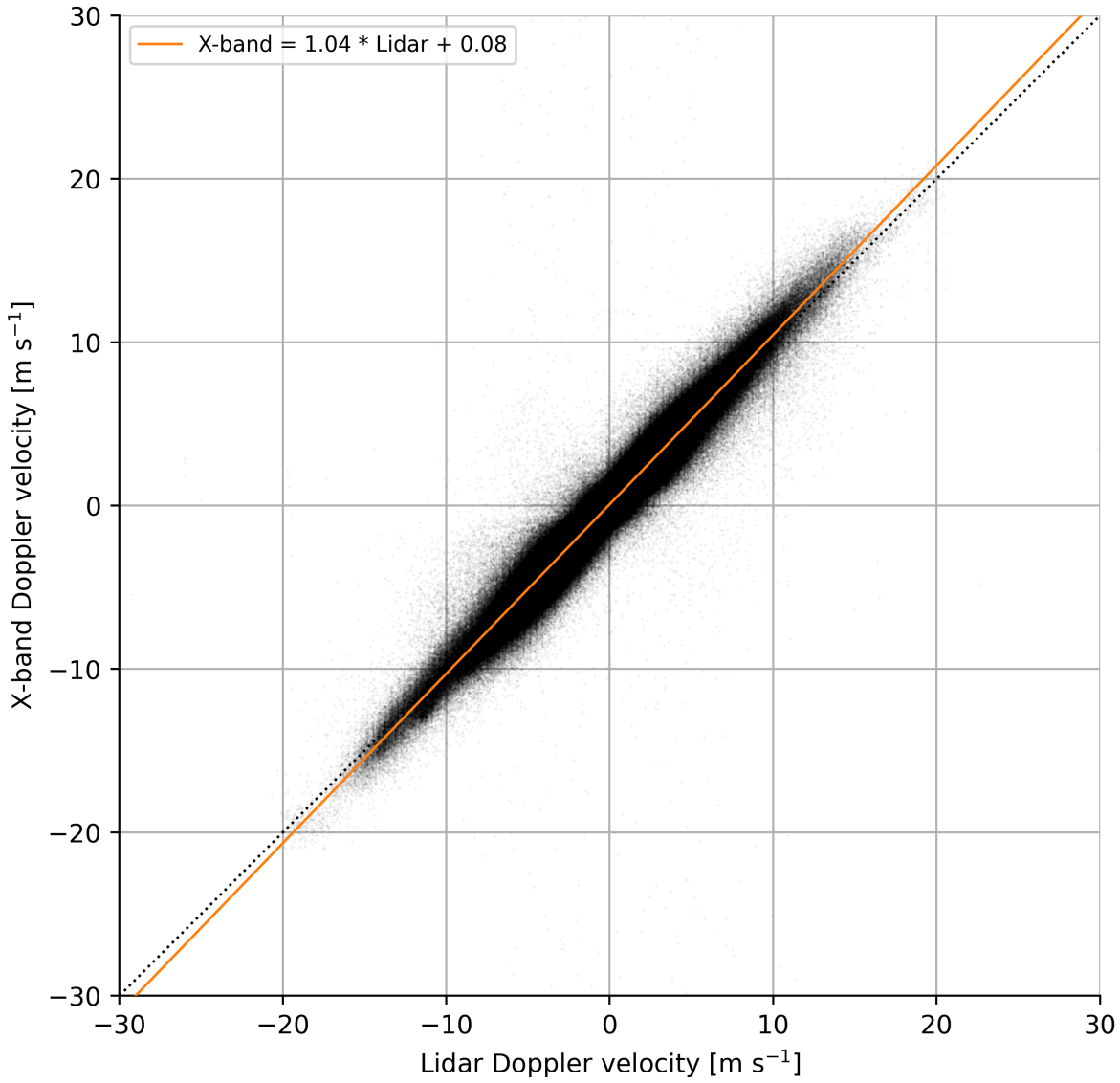

Figure 1: Scatterplot of Doppler lidar versus X-band radar radial Doppler velocity measurements where X-band radar $Z_{DR} \geq 5$ and $\rho_{HV} \leq 0.9$. The orange line indicates the linear fit to the data and the black dashed line indicates the one-to-one agreement.