

Validation of the geostrophic approximation using ERA5 and the potential of long-term radio occultation data for supporting wind field monitoring

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The manuscript aims to validate the use of ERA5 reanalysis data and radio-occultation (RO) data for long-term monitoring of wind fields. First the geostrophic relation is validated by comparing long-term averages of ERA5 wind speed data with geostrophic wind speed data determined from ERA5 geopotential data and, secondly, geostrophic wind speed derived from radio occultation geopotential data are compared with the ERA5 geostrophic winds. The manuscript concludes that RO determined wind data can provide added value to ERA5 wind data, for the benefit of wind field monitoring.

The manuscript is quite well written. I have one basic principal hesitation. As I understand it, and it is also stated on line 44 of the manuscript, RO observation data are assimilated into operational analysis for forecasting purposes as well as into reanalysis. In this case ERA5 data and RO data are dependent and should not be used to validate the potential of RO data to support wind field monitoring. It may even be so that RO data is the dominating observation data source over else data-void areas like oceans. The differences between Figures 7e (Northern Hemisphere winter) and 7f(Southern Hemisphere) support this criticism.

Other views

- Line 13: Also the use of ERA5 wind analysis data to compare and validate ERA5 geostrophic wind data based on ERA5 geopotential data is questionable. The ERA 5 wind and geopotential analysis increments are coupled via near-geostrophic linear relations. For this reason ERA5 wind and geopotential data are deterministically dependent, although the long term mean increment may be very small.

- Line 73: In my view, in case RO observations were used already, they cannot provide any further “added value”.

- Line 80: It is stated that a latitude-longitude grid of 2.5 degrees resolution is used for ERA data. Please inform whether 2.5.degrees is also the resolution of the input spectral ERA5 data. Furthermore a latitude-longitude grid is not optimal for calculation of geostrophic winds in polar areas. Alternative Grids should be considered, at least in polar regions.

Lines 104-108: The sentence “RO data show 2019)”. is a bit un-clear.