
Doppler radial wind assimilation in the GFS with an observing system simulation experiment

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Abstract

An observing system simulation experiment using the GFS was performed to test the impacts of assimilating Doppler radial wind observations in an idealized framework. The goal of this study is to lay the groundwork for assimilating radial wind observations within the GFS by (1) first assess the impact of assimilating radial winds from a network that is accessible to the US today (i.e., the NEXRAD network), (2) explore a scenario where all worldwide radial winds are available for assimilation, and (3) a hypothetical scenario where the worldwide network was designed with highly uniform spatial coverage. The final experiment is intended to provide an upper limit on the impact, useful for assessing the relative values of the real networks. In each of these experiments, only radial wind observations are assimilated to simplify and isolate the impact of such observations. The NEXRAD network alone improves the forecast skill over the US but is not able to constrain the forecast in up/downstream data void regions. The realistic worldwide radar network shows improved results over both continental as well as oceanic data void regions and demonstrates quantitatively comparable performance to the purely hypothetical network. This work suggests that the assimilation of global Doppler radial wind data could be beneficial to the GFS, and likely other global NWP applications; however, such potential can only be realized if Doppler radial wind data are accessible.

Keywords: GFS, radial wind, data assimilation, OSSE

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