Supporting Information for "Explicit nested-grid prediction of convective-scale motions in a skillful global model"

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Contents

Introduction

Text S1.

Description of simulations: The nested-grid simulations described in this paper used version verona_IPDv4p0 of fvGFS. Configuration d4a was used from 1 to 29 April. A minor change to the sponge layer configuration, d4b, was introduced on 30 April to improve the stability of the real-time system. A second change, d4c, was introduced on 5 May, to enable the energy conservation in the flux damping and to make minor tweaks to the microphysics. The d4b configuration was used for the hindcasts. The real-time 13-km global simulations use package_release_0.11; this version uses the version of SAS described by Han and Pan (2011) instead of scale-aware SAS.

The real-time forecasts were run on NOAA's Jet supercomputer on its xJet partition; the hindcasts were performed on on NOAA's Gaea supercomputer on its c4 partition.

Real-time forecasts are stored in the GFDL Tape Archive System at /arch0/m1m/NGGPS/verona_IPDv4_sfe_beta ; hindcasts are stored at /arch7/lmh/NGGPS/verona_IPDv4p0-pre-hc

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Table 1. Model configurations discussed in this manuscript. All models use Noah and RRTM for the land surface and radiation, respectively. Note that the GFS was updated in early 2017 and so some of the parameterizations differ for the two time periods in the text.

	Operational GFS		GFDL fvGFS			Operational
	2015	2017	13-km	nested (noconv)	nested SA-SAS	NAM nest
Dynamical core	GFS Spectral		FV^3			NMMB
Nominal resolution	13 km		13 km	13 & 3 km	13 & 3 km	3 km
Convection	SAS	SA-SAS	SAS	none	SA-SAS	none
PBL	Han and Pan	EDMF	Han and Pan	Modified Han and Pan		Mellor-Yamada-Janjic
Microphysics	Zhao-Carr		GFDL			Ferrier-Aligo

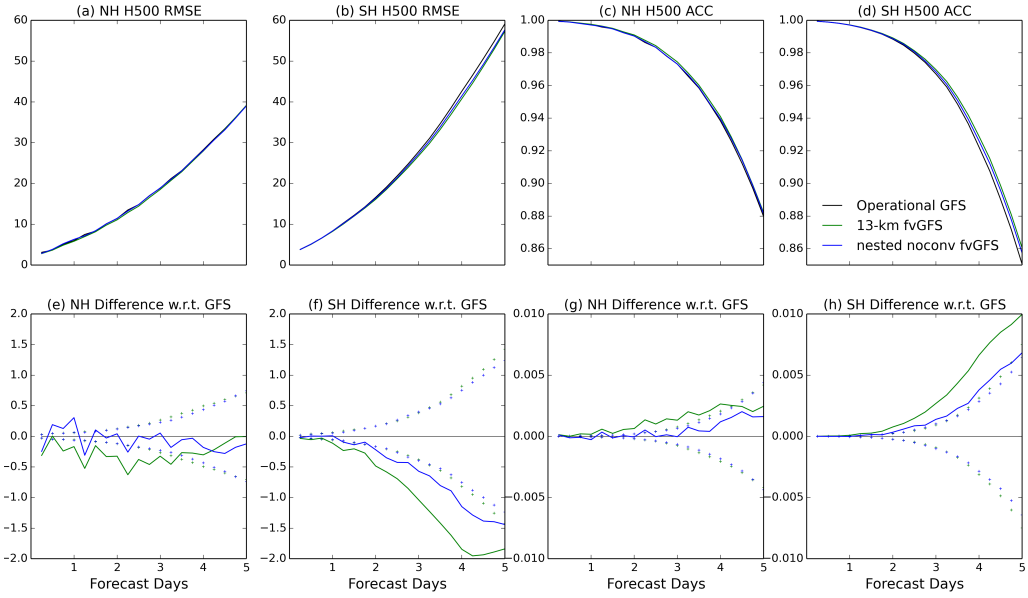

Figure 1. As in Figure 2 but for the five-day forecasts during the 2017 Spring Experiment Period (1 April – 16 June 2017). Note that the southern hemisphere skill (f, h) is significantly better than the operational GFS for both models while it is only slightly better in the northern hemisphere (e, g); we have found that our forecast skill is significantly better than GFS in the cool season.

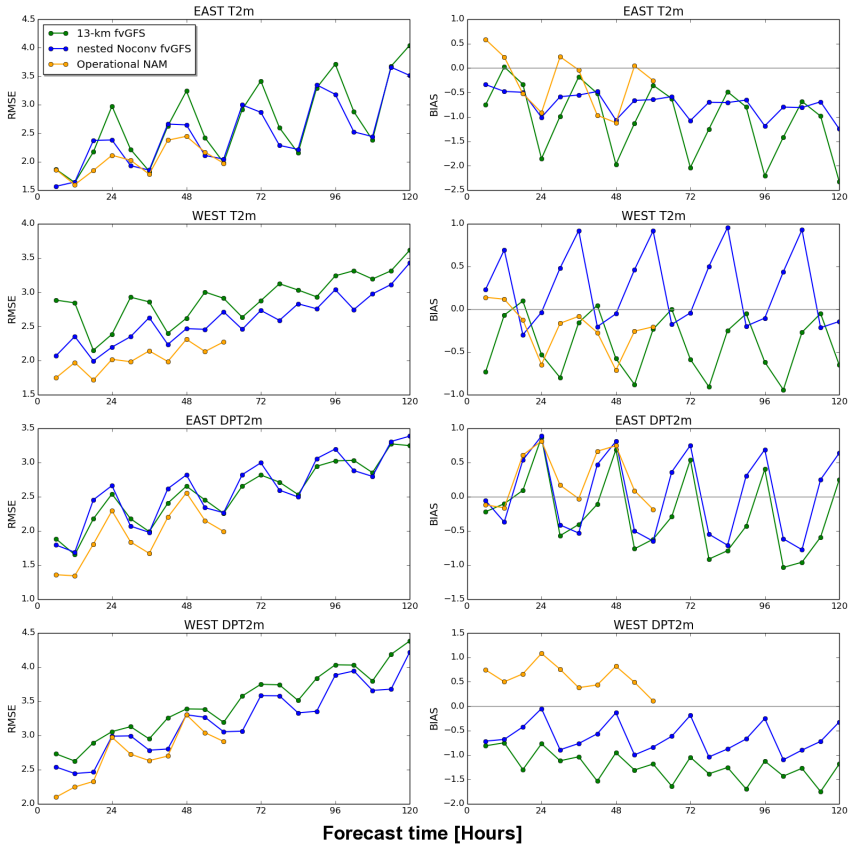

Figure 2. As in Figure 3 but for the 2017 Spring Experiment Period, and compared to the operational 3-km NAM.

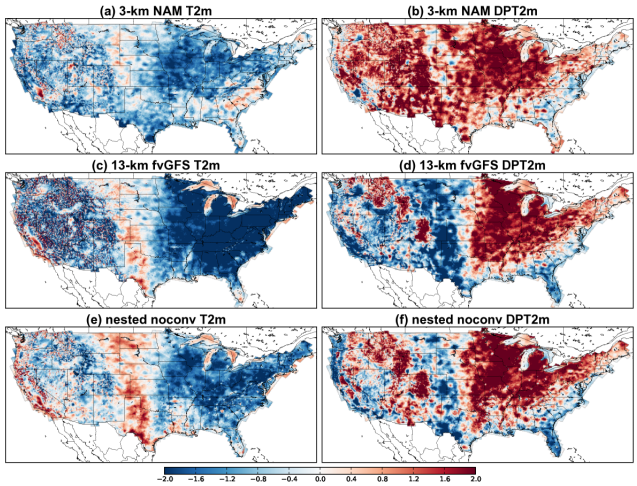

Figure 3. As in Figure 4 but for the 2017 Spring Experiment Period, and compared to the operational 3-km NAM.

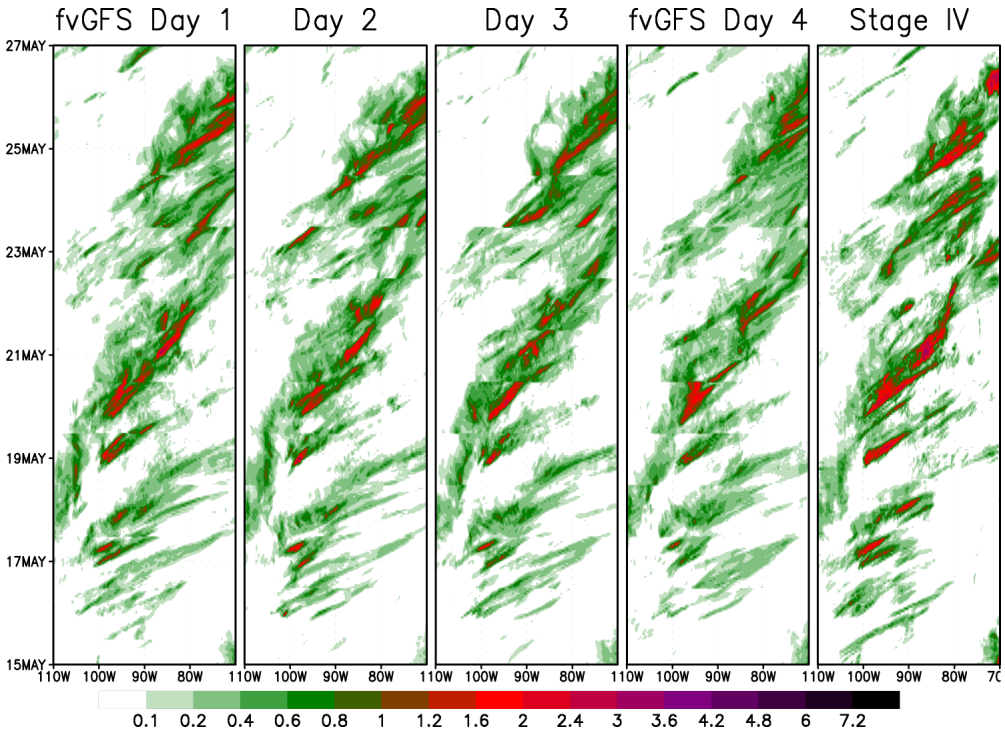

Figure 4. As in Figure 10 but for the 13-km fvGFS.