EFSO at different geographical locations verified with observing system experiments

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Abstract

An ensemble-based forecast sensitivity to observations (EFSO) diagnosis has been implemented in an AGCM–LETKF data assimilation system to estimate the impacts of specific observations from the quasi-operational global observing system on weekly short-range forecasts. It was examined whether EFSO reasonably approximates the impacts of a subset of observations from specific geographical locations for 6-h fore- casts, and how long the 6-h observation impacts can be retained during the 7-day forecast period. The reference for these forecasts was obtained from 12 data-denial experiments in each of which a subset of three radiosonde observations launched from a geographical location was excluded. The 12 locations were selected from three latitudinal bands comprising (i) four Arctic regions, (ii) four midlatitude regions in the Northern Hemisphere, and (iii) four tropical regions during the Northern Hemisphere winter of 2015/16. The estimated winter-averaged EFSO-derived observation impacts well corresponded to the 6-h observation impacts obtained by the data denials and EFSO could reasonably estimate the observation impacts by the data denials on short-range (from 6 h to 2 day) forecasts. Furthermore, during the medium-range (4–7 day) forecasts, it was found that the Arctic observations tend to seed the broadest impacts and their short-range observation impacts could be projected to beneficial impacts in Arctic and midlatitude North American areas. The midlatitude area was located just downstream of dynamical propagation from the Arctic toward the midlatitudes. Results obtained by repeated Arctic data- denial experiments were found to be generally common to those from the non-repeated experiments.

Keywords: FSO, OSE, observational campaign, global reanalysis, weekly forecasts

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