Description of the objective analysis of large-scale forcing data for GOAmazon field campaign

1. Overview

The constrained variational objective analysis approach described in Zhang and Lin [1997] and Zhang et al. [2001] was used to derive the large-scale single-column/cloud resolving model forcing and evaluation data set during the Green Ocean Amazon 2014/5 (GOAmazon). The derived large-scale forcing data help to understand the role of the adiabatic heating and moistening profiles associated with local convections as a major driver of the atmospheric circulation far away from the Amazonia region, and provide a realistic representation of large-scale dynamical fields to simulate tropical clouds and convections accurately. Two versions of large-scale forcing data are provided. One is continuous forcing for the full year 2014 and 2015; the other is for the two IOPs in 2014: the 1st IOP (wet season) from 15 Feb to 26 Mar 2014, the 2nd IOP (dry season) from 1 Sep to 10 Oct 2014.

The forcing data represent an average over the analysis domain centered at SIPAM radar station at Manaus, Brazil with a radius of 110 km as shown in Figure 1. The forcing data was developed based on ERA-interim reanalysis, which were then constrained with surface and TOA observations through the constrained variational objective. Surface precipitation is obtained from Courtney Schumacher's (Texas A&M) group, which is derived from the SIPAM radar operated at the Ponta Pelada airport. In the two-year continuous forcing, other constraints are obtained from ERA-interim reanalysis. In the forcing of the two IOPs, TOA radiative fluxes are obtained from Patrick Minnis's group using GOES-13 visible and infrared radiances. Surface radiative and turbulent fluxes are obtained from combination of three surface stations (ARM mobile facility, K34/ZF station and ATTO tower observatory) and ERA-interim. The details of the forcing data can be found in Tang et al. [2016]. Time resolution is 3 hour and vertical resolution is 25mb.

2.. Some details of the analysis

In the file self-description, some data sources are from "ECMWF analysis", they should be all from "ERA-Interim reanalysis".

Please be careful when comparing this dataset with the ARM single-point measurements at Manacapuru (ARM MAO site). The timing may not be consistent since the ARM MAO site is located ~70km west of Ponta Pelada (center of variational analysis domain).

In the 2-year continuous forcing data, missing SIPAM radar data with gap >12hr are filled with TRMM 3B42 products rescaled to the rain rates of SIPAM radar averaging in ±15days window. Missing periods <12hr are filled by linear interpolation. The time periods when missing radar data is filled by TRMM 3B42 V7 are listed in the global attributes in the netCDF file.

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3. References

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Figure 1: The location of GoAmazon site in this study. The red octagon represents the analysis domain. Locations of observational sites are indicated by yellow pentagrams.