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The next-generation GSMaP MWI precipitation retrieval algorithm

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1. Introduction

The current GSMaP Microwave Imager (MWI) precipitation retrieval algorithm degrades retrieval accuracy for weak precipitation areas where MWI brightness temperatures (TBs) are sensitive to physical variables other than precipitation. In order to address this issue, we have been developing a new algorithm that retrieves the physical variables including precipitation from MWI TBs. The basic idea of this algorithm is to derive the statistically optimal values of the physical variables, based on Bayes's theorem (Elsaessar and Kummerow 2008, Boukabara et.al 2011). We adopted an ensemble-based variational method (EnVA) for deriving the optimal values from MWI TBs that are non-linear functions of the physical variables. The retrieval algorithm consists of the precipitation detection part and the retrieval part for physical variables in precipitation areas. In this presentation, we will report the precipitation detection part.

2. Precipitation detection part

In the precipitation detection part, we chose surface temperature (Ts), sea surface wind speed (SWS), precipitable water content (PWC), and cloud liquid water content (CLWC) as the over-sea control variables, Ts and surface emissivity (Es) as the over-land control variables, assuming no precipitation.

The EnVA employed forecasts of a cloud-resolving model (CRM) as the first guess of the physical variables, and estimated the first guess error covariance from CRM ensemble forecast. The EnVA calculated innovations and post-fit residuals of MWI TBs that were then used for the precipitation detection.

Keywords: GSMaP, MWI, GPM, GCOMW, precipitation retrieval