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Plan on Developing Forcing for AMIE-Manus and AMIE-Gan Field Campaigns

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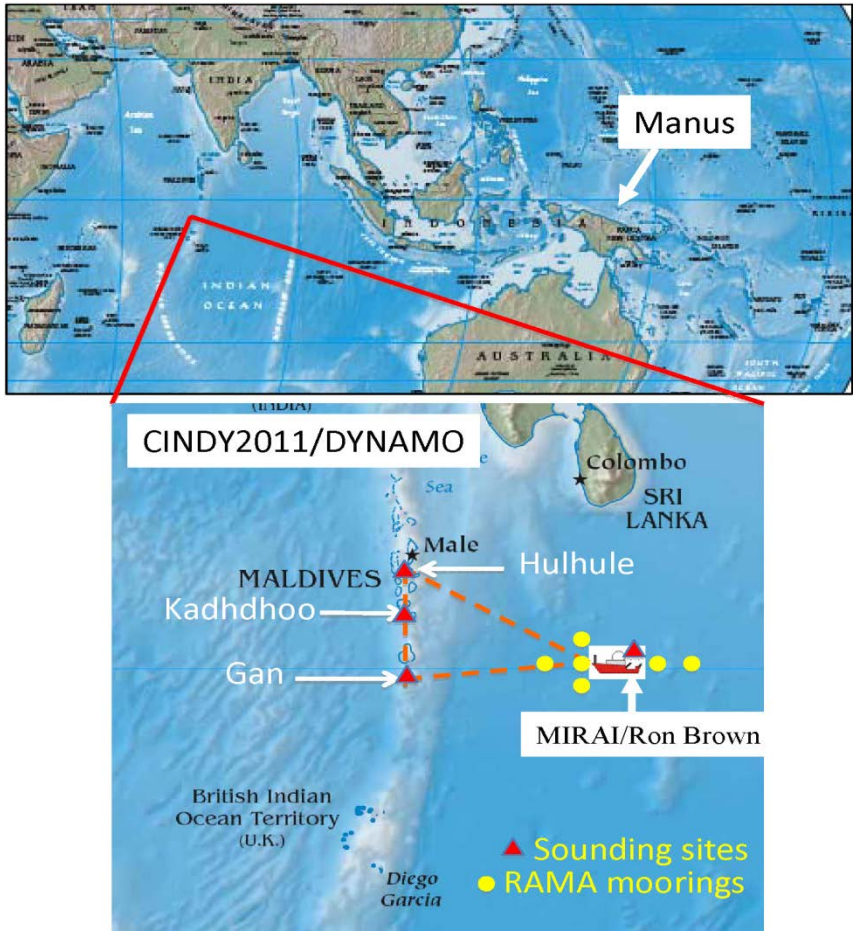
Overview

- 10/01/11 - 03/31/12
- AMIE-Manus/AMIE-GAN/DYNAMO/CINDY2011
- DYNAMO sounding array for AMIE-GAN
- Increased frequency of sonde launches for AMIE-Manus
- C-POL scanning precipitation radar at both sites to provide a good estimate of area mean precipitation
- ECOR surface fluxes
- NWP Analyses (ECMWF or MERRA??)
- Satellite products (Pat Minnis VISST??)



Objective Analysis Method

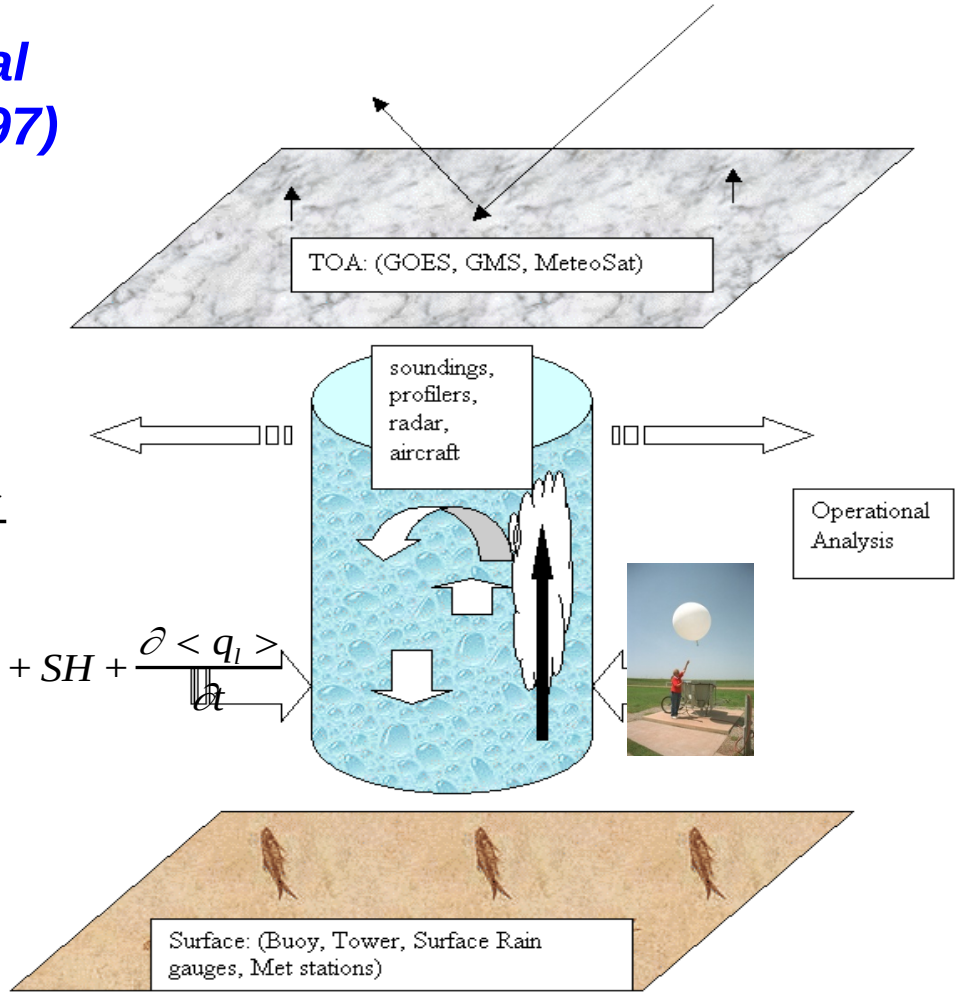
The Constrained Variational Analysis (Zhang and Lin 1997)

$$< \nabla \cdot \vec{V} >= -\frac{1}{gp_s}\frac{dp_s}{dt}$$

$$\frac{\partial < q >}{\partial t} + < \nabla \cdot \vec{V}q >= E_s - Prec - \frac{\partial < q_l >}{\partial t}$$

$$\frac{\partial < s >}{\partial t} + < \nabla \cdot \vec{V}s >= R_{TOA} - R_{SRF} + LPrec + SH + \frac{\partial < q_l >}{\partial t}$$

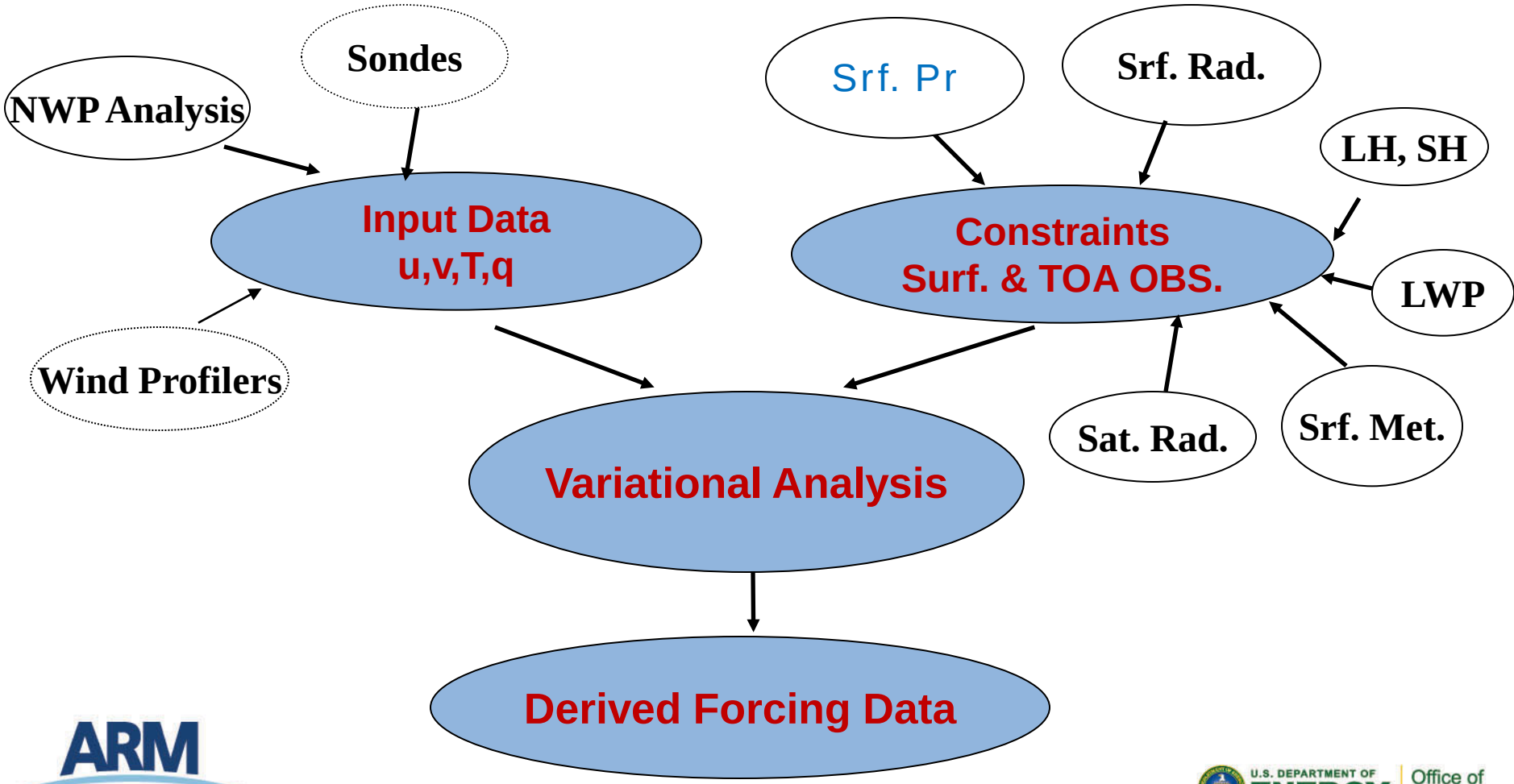
$$\frac{\partial < \vec{V} >}{\partial t} + < \nabla \cdot \vec{V}\vec{V} > - f\vec{k} \times < \vec{V} > - \nabla < \phi >= \vec{\tau}_s$$



Forcing is dynamically and thermodynamically consistent

(Courtesy of Dr. M. Zhang)

Data Need for the Variational Analysis



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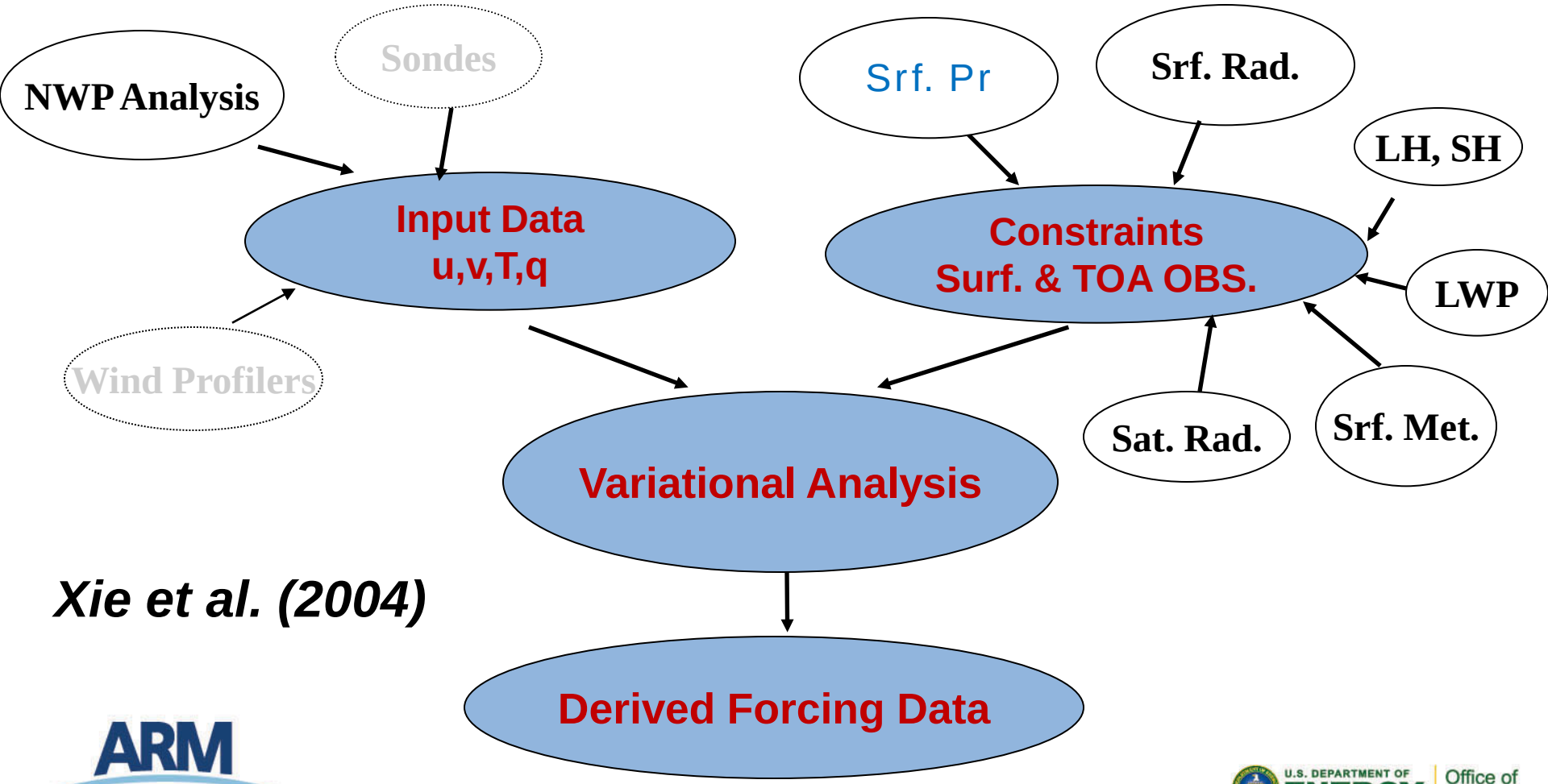
Our Plan: Derive the forcing based on NWP analyses



Xie et al. (2004)

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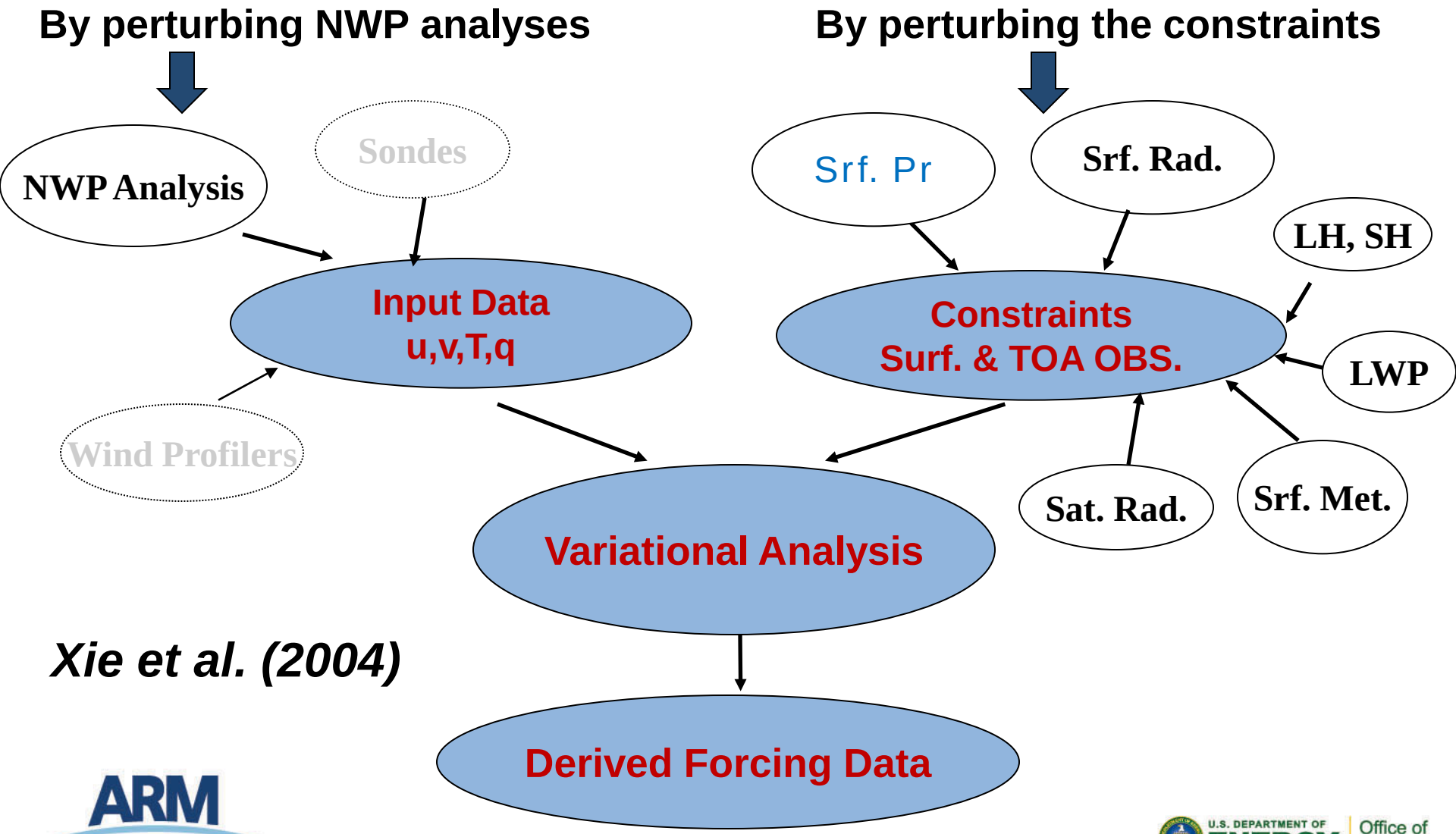
Create ensemble forcing to address uncertainties in analyses and srf fluxes



Xie et al. (2004)

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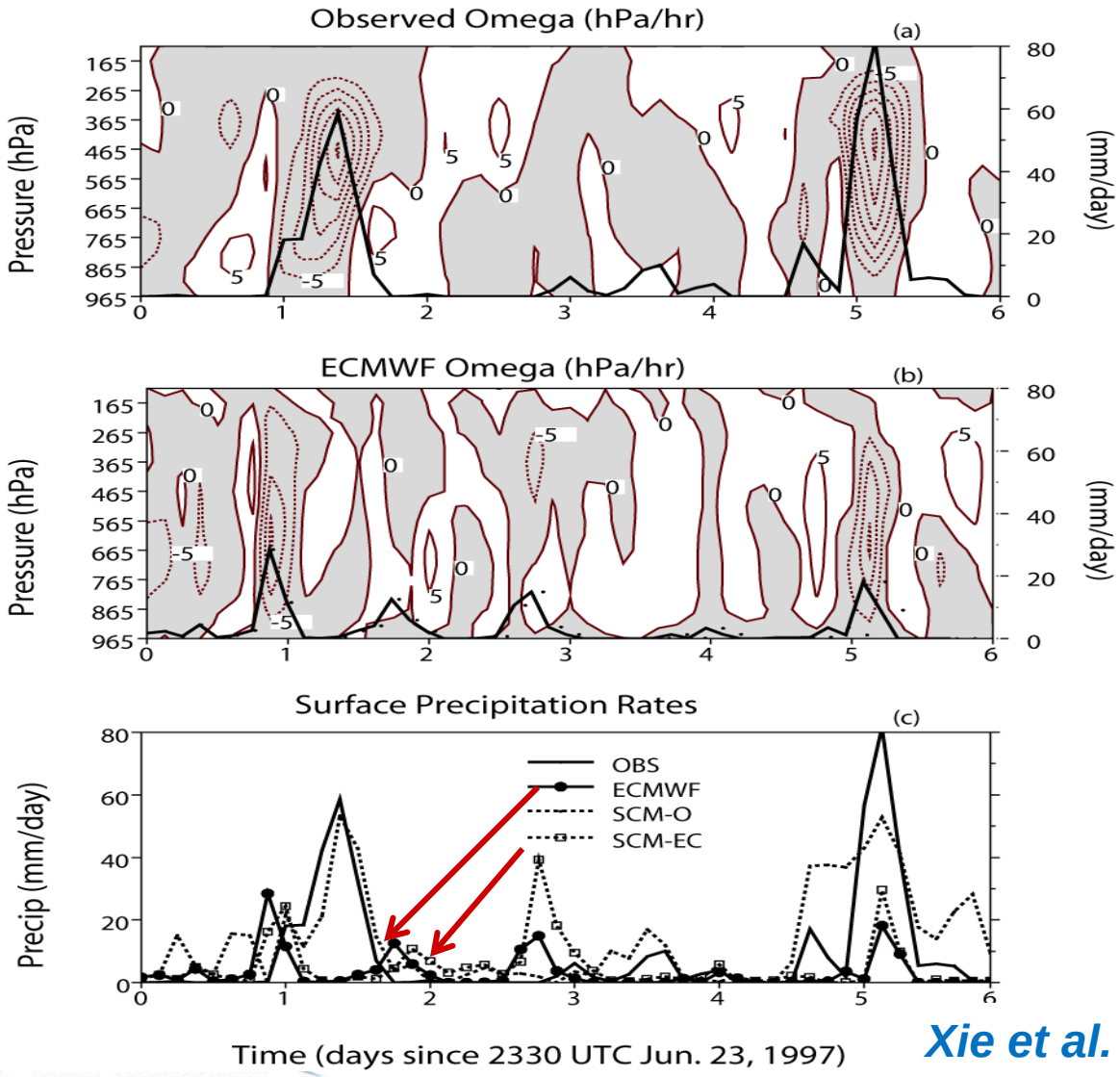
Issues with NWP Forcing



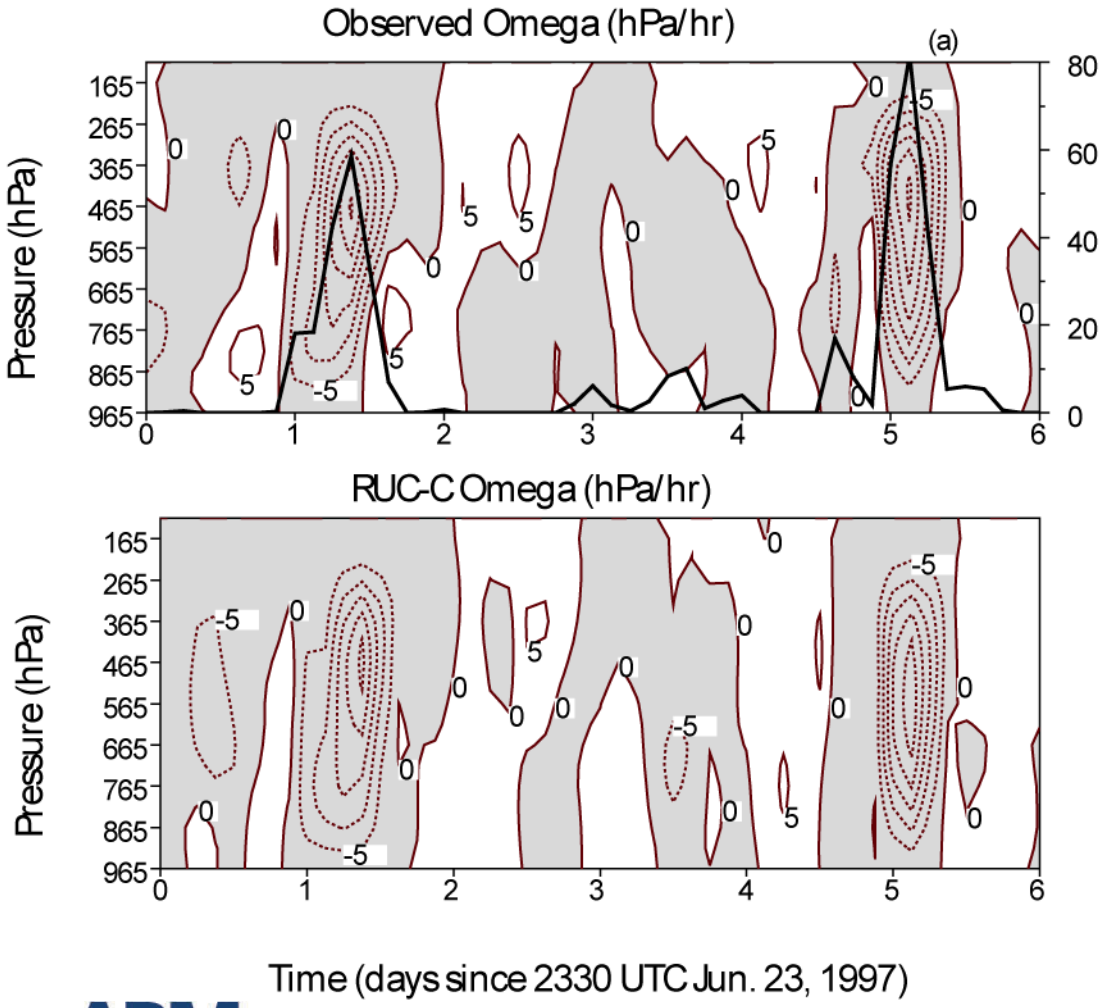
OBS vs. NWP Forcing

NWP forcing is affected by deficiencies in parameterizations the forecast model uses

SCM forced by the NWP forcing tends to follow the NWP model results rather than the observations

Xie et al. (2004)

ARM constraints improve NWP forcing



OBS vs. Cont. Forcing

The observed surface and TOA constraints significantly improve the quality of the forcing derived from NWP analysis

Xie et al. (2004)

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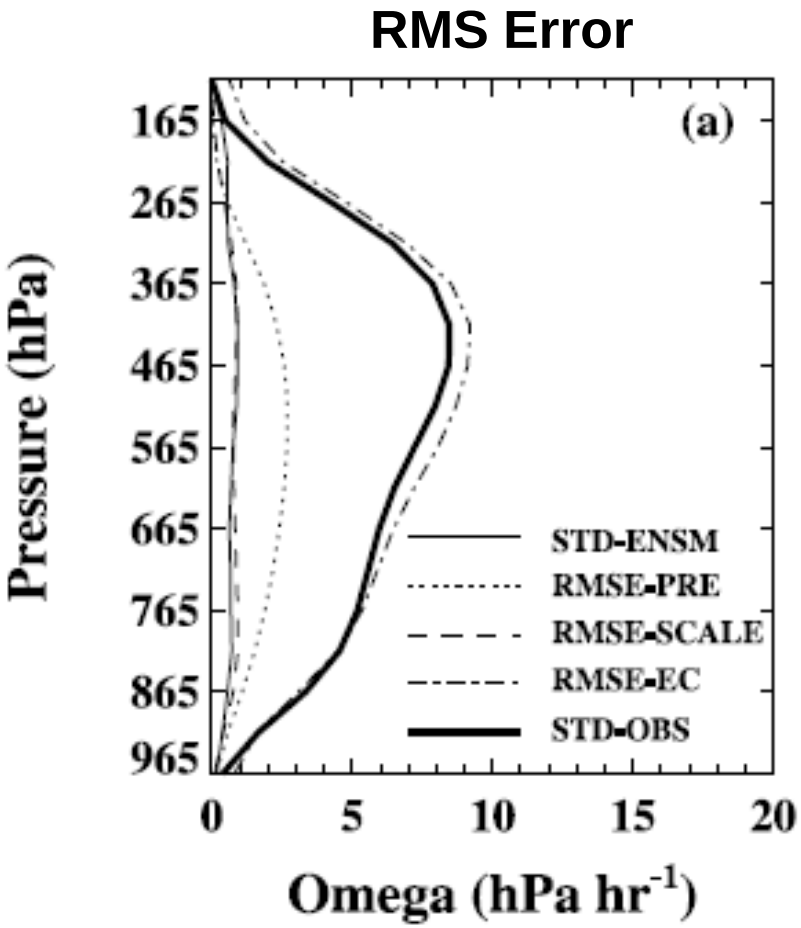
ARM constraints improve NWP forcing



Errors in the sensitivity tests are significantly smaller than the observed temporal variability of the observed omega and the errors in ECMWF forcing

Xie et al. (2003)

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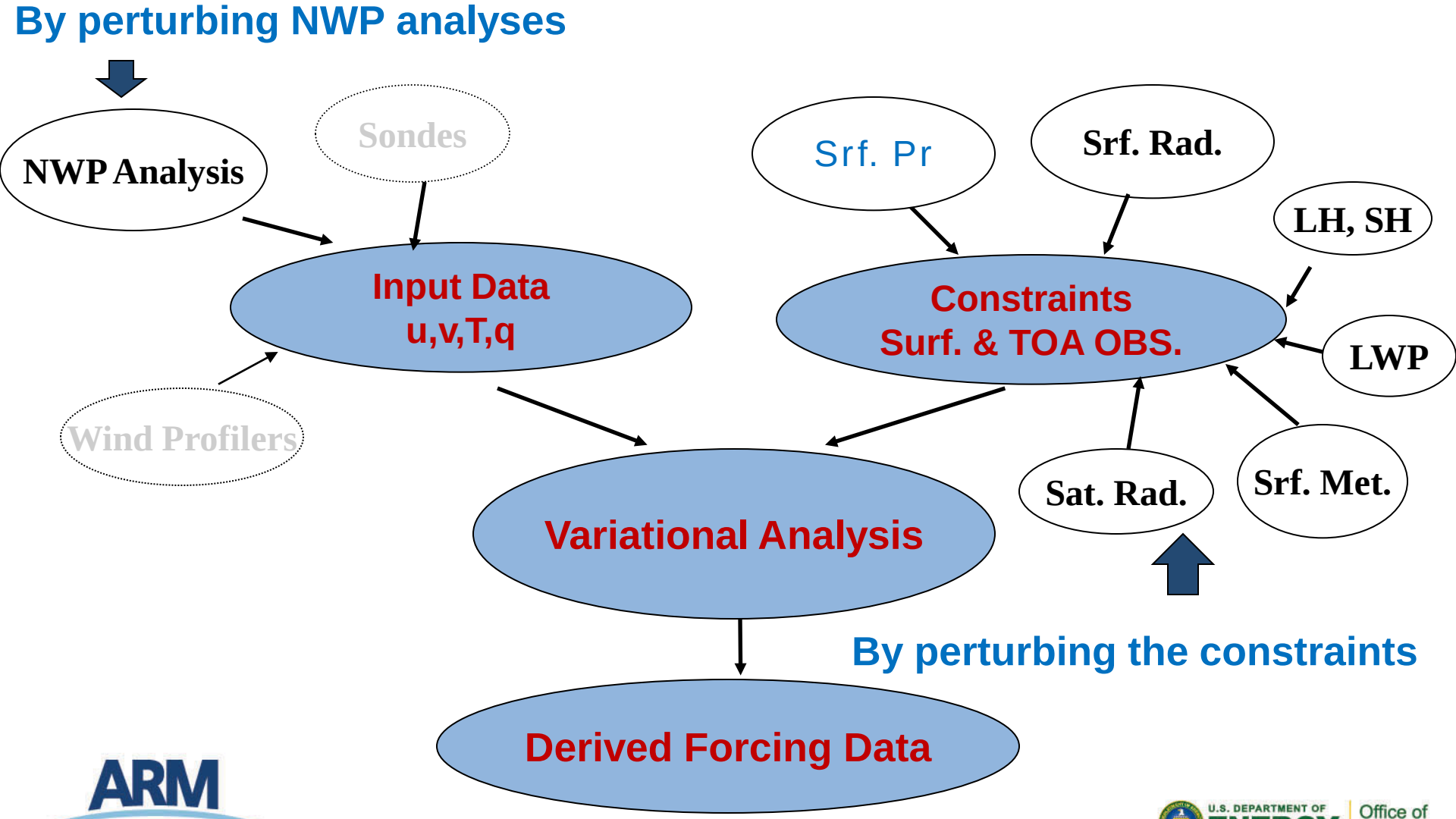
Our Plan: create an ensemble forcing dataset -- Comments???



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