Uncertainty propagation from WRF to a Lagrangian particle dispersion model

Wayne M. Angevine and Jerome Brioude
CIRES, University of Colorado, and NOAA ESRL
Wayne.M.Angevine@noaa.gov

Introduction

Lagrangian Particle Dispersion Models (LPDMs) are used to simulate transport of pollutants. They are quite efficient for either forward-in-time or backward-in-time simulations. Backward simulations are used to determine the sources of constituents measured at a site or on a moving platform.

Uncertainties in LPDM simulations are (probably) dominated by uncertainty in the driving meteorological fields, usually produced by a model like WRF. However, assessing these uncertainties is difficult and often neglected.

Key points:

- We present results from an ensemble of plausible WRF simulations driving otherwise identical LPDM (FLEXPART) simulations
- We assert that ensemble spread of wind and mixing height is related to uncertainty in the LPDM concentrations
- No obvious relationships are found between concentration spread and PBL height, wind speed, or ventilation
- Spreads, and therefore uncertainties, within the LA basin are small

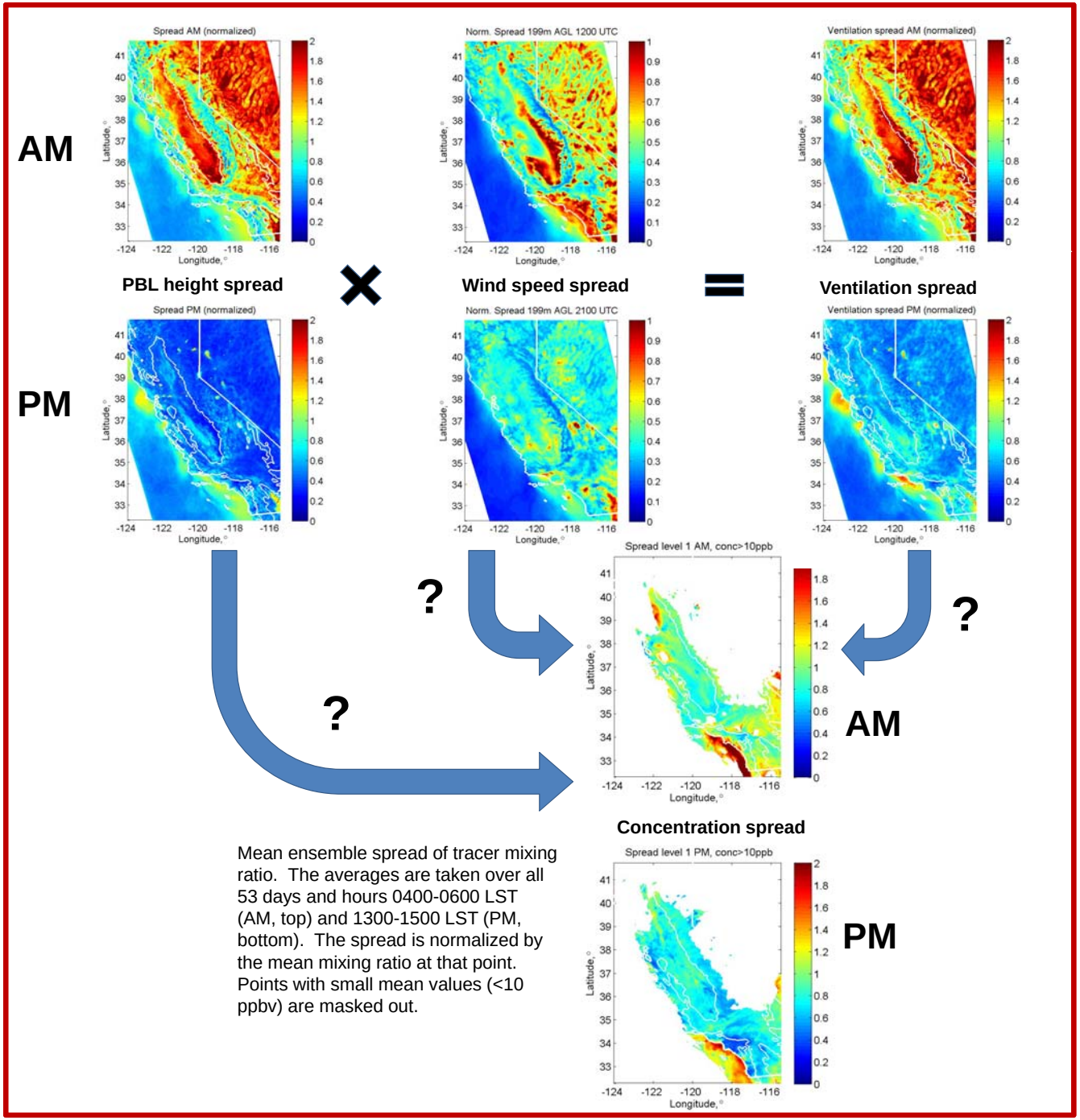
Details:
Five WRF runs with differing

- PBL (TEMF & MYJ)
- LSM (Slab & Noah)
- Initialization (GFS & ERA-Interim)

evaluated by Angevine et al. (2012, MWR)

FLEXPART runs for 53 days (4 May – 30 June 2010) over California with CO emissions from NEI05 on-road only

Why are there no obvious relationships? Concentration at a point is the result of transport over time and space, including times and places with varying PBL heights and wind speeds. California's terrain and meteorology are complex. If the relationships were simple, we would not need to run the transport model!



Mean ensemble spread of tracer mixing ratio. The averages are taken over all 53 days and hours 0400-0600 LST (AM, top) and 1300-1500 LST (PM, bottom). The spread is normalized by the mean mixing ratio at that point. Points with small mean values (<10 ppbv) are masked out.