forecasting prolonged inversions in northern Utah
Northern Utah's air is the worst in the nation

WHY?
Remember the winter stationary waves?

Long inversion of 1-2 weeks is common
Through these research

We found connection of inversions with the Madden–Julian oscillation (MJO)

The largest element of intraseasonal (30–60 day) variability in the tropical atmosphere.
What we knew then (in 2009):

Operational mode: NOAA’s Climate Forecast System (CFSv1)

CFS predicts MJO out to ~1 month
(Seo et al. 2007, 2009; Weaver et al. 2009)
Prolonged inversions (ridges) are linked to MJO

**Fact:**

CFS predicts MJO out to ~1 month (Seo et al. 2007, 2009; Weaver et al. 2009)

Developed nCFS–empirical hybrid prediction for prolonged inversions
Experiment for the 2003-2004 winter

A prolonged inversion event

Surface inversion probability

PM2.5 (μg m⁻³)

Regression (CFS)

Regression (obs)

PM2.5 (SLC)
Utah Climate Center Product:

Surface Inversion Probability for Northern Utah Valleys
14 Feb - 31 Mar, 2013

Surface inversion probability for Northern Utah Valleys. Probabilities above ~35% (left axis) have a statistical significance of manifesting as persistent (> 4 days) inversion events. Grey shading denotes measured Cache Valley PM2.5 levels (right axis); black line is 24-hour ave. pm2.5.
Skill score:

Circulation pattern @ Western US

Testing how good the model is

Inversion prediction for Salt Lake City

~30 days!
S2S forecast of the dipole is possible!