Quantifying the Bias in MOT Reconstruction from Noble Gas Saturation Anamolies between the LGM and PI

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October 7, 2022

Where are we now?

A Brief Overview

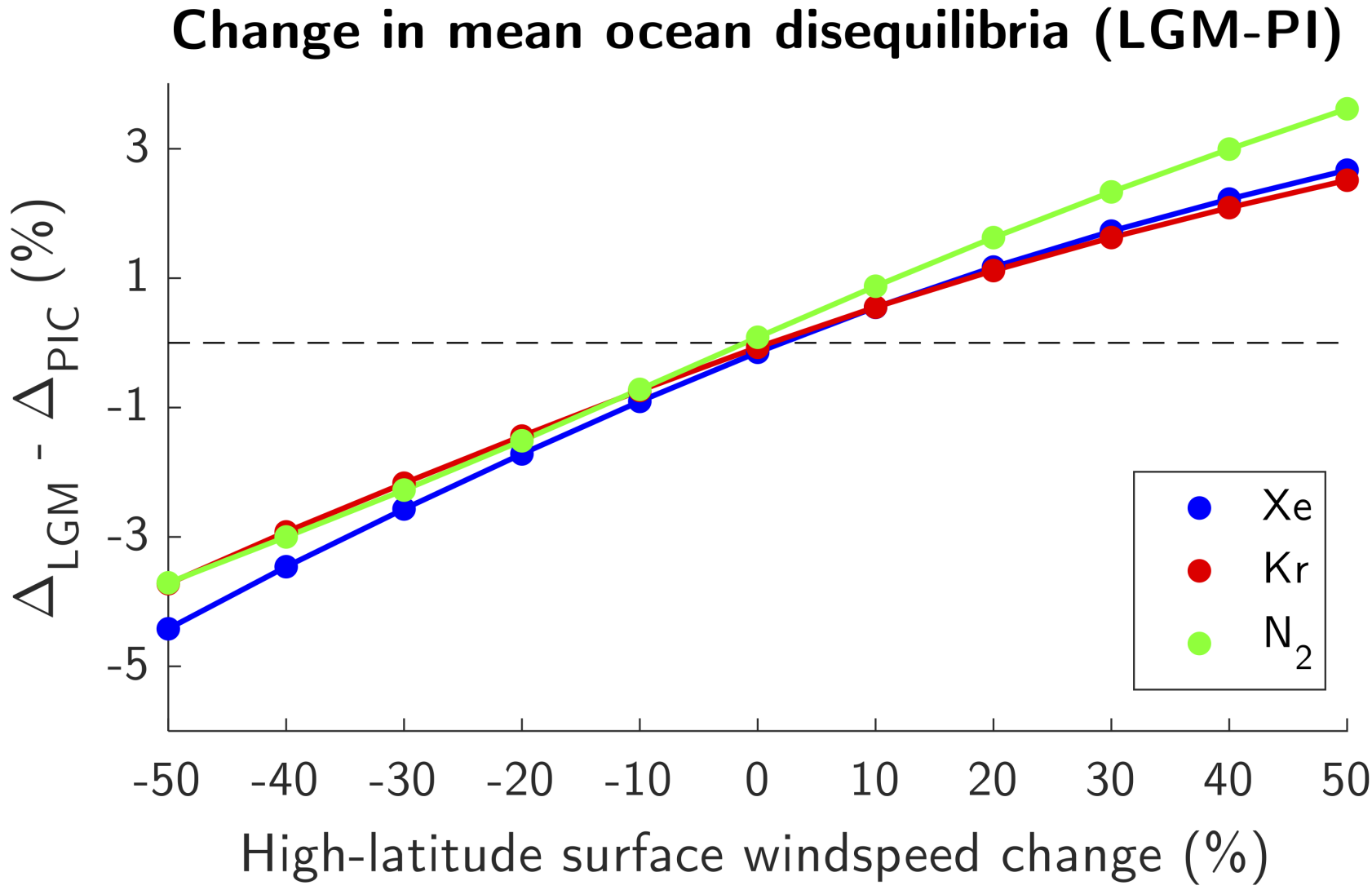
We couple a gas exchange model with an ESCM to estimate the global, volume-weighted mean Δ of the following gases: N_2, Ne, Ar, Kr, and Xe.

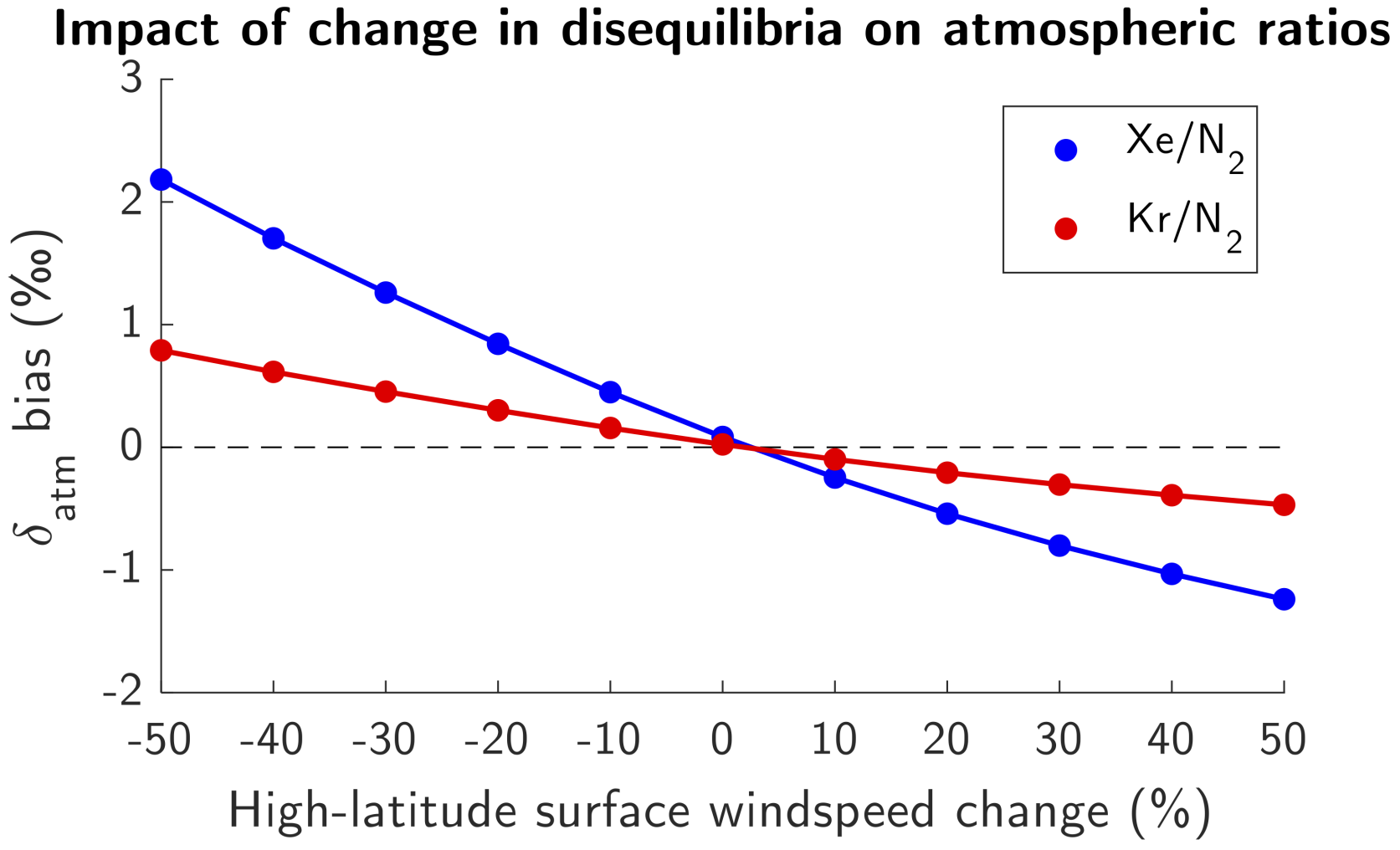
The bubble flux model parameterizes flux via the simplified following equation:

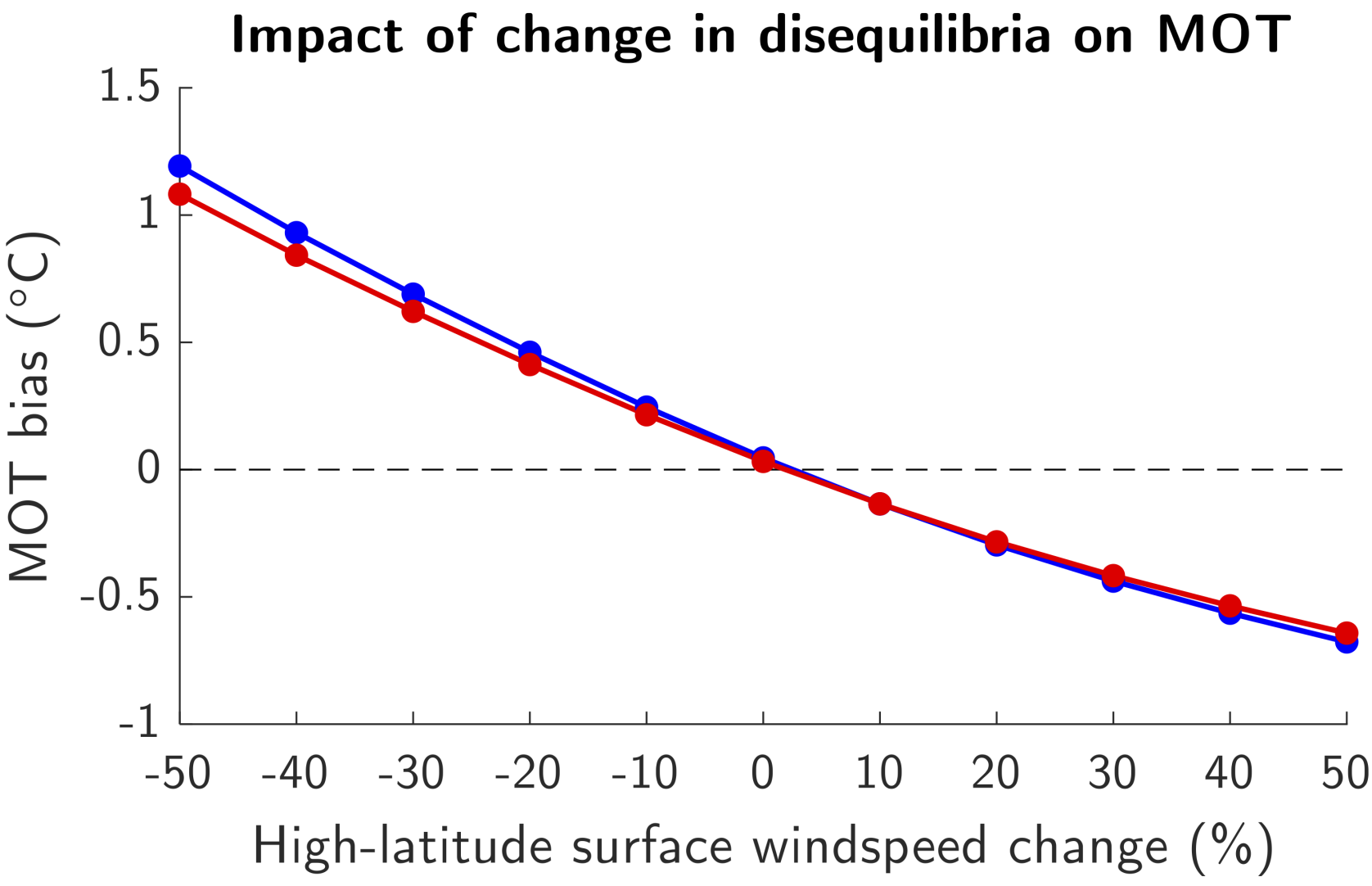
$$\mathcal{F}_n = \mathcal{F}_s + \mathcal{F}_p + \mathcal{F}_c \propto u_{10}^l, \tag{1}$$

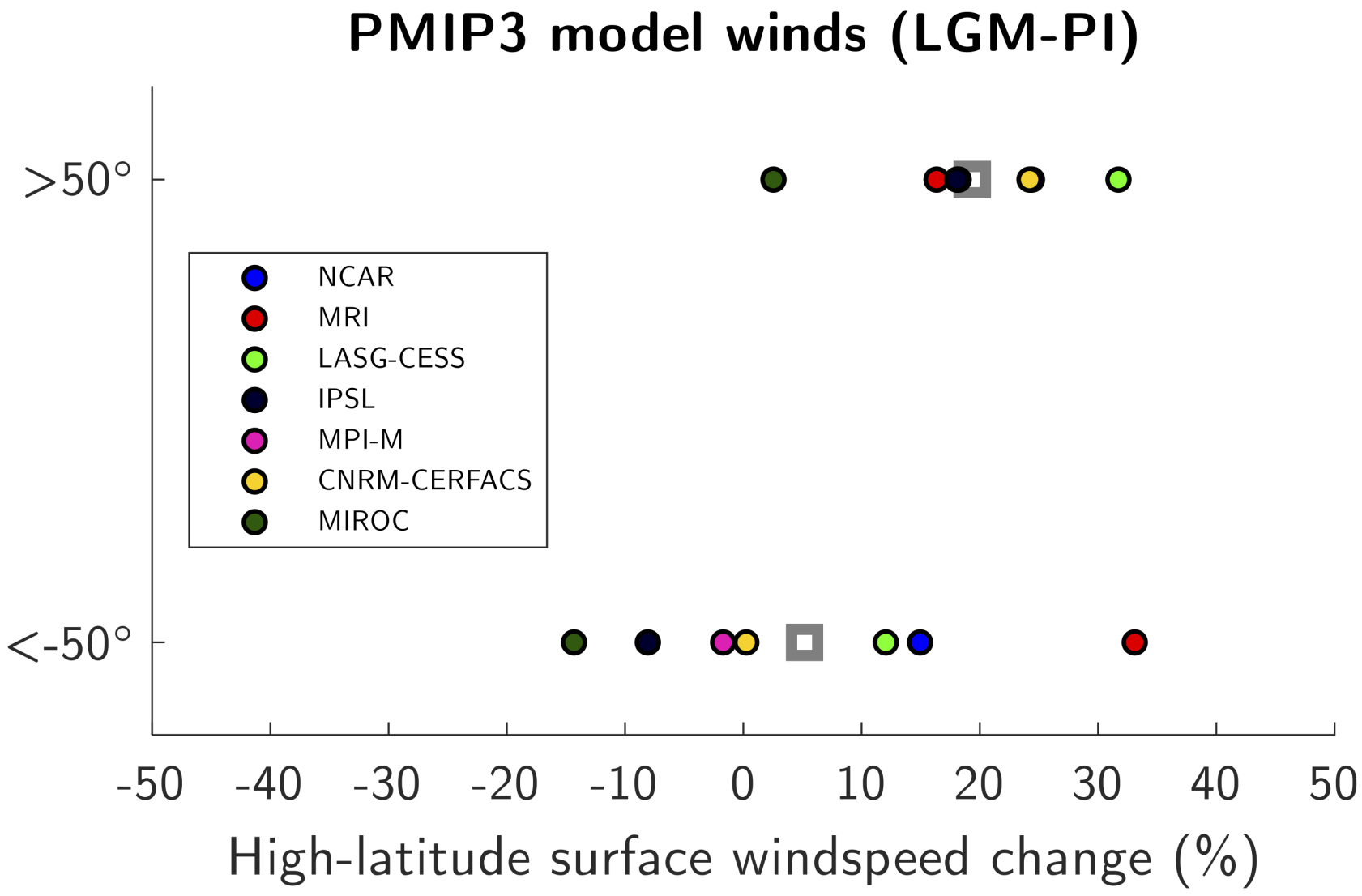
for l a range of power laws presented in *Liang et al. (2013)*.

This suggests that while there are many parameter sensitivities to test, the effect of changing winds are to leading order the most important to gain an understanding of.


Change in mean ocean disequilibria (LGM-PI)
Δ_{LGM} - Δ_{PIC} (%)
3
1
-1
-3
-5
-50
-40
-30
-20
-10
0
10
20
30
40
50
High-latitude surface windspeed change (%)
Xe
Kr
N_2


Impact of change in disequilibria on atmospheric ratios
3
2
1
0
-1
-2
δ_{atm} bias (‰)
Xe/N2
Kr/N2
-50
-40
-30
-20
-10
0
10
20
30
40
50
High-latitude surface windspeed change (%)


Impact of change in disequilibria on MOT
MOT bias (°C)
1.5
1
0.5
0
-0.5
-1
-50
-40
-30
-20
-10
0
10
20
30
40
50
High-latitude surface windspeed change (%)


PMIP3 model winds (LGM-PI)
>50°
<-50°
NCAR
MRI
LASG-CESS
IPSL
MPI-M
CNRM-CERFACS
MIROC
-50
-40
-30
-20
-10
0
10
20
30
40
50
High-latitude surface windspeed change (%)

Bias Estimates

From this work, we find the following bias in MOT reconstruction from Noble gas saturation anamolies:

Windspeed (%)	**Bias (°C)**
[0, +30]	[+0.05, -0.44]

Where do we want to go?

Next Steps

Some possible new directions:

1.) Run these simulations with the ECCO or mitGCM-derived TMs,

2.) Develop a simple, dynamical model of bubble evolution in the surface ocean to better understand the mechanisms behind the parameterizations from *Liang et al. (2013)*,

3.) Work on sub-grid scale parameterizations derived from probability density functions of parameters and extreme value theory (i.e., committor probability).