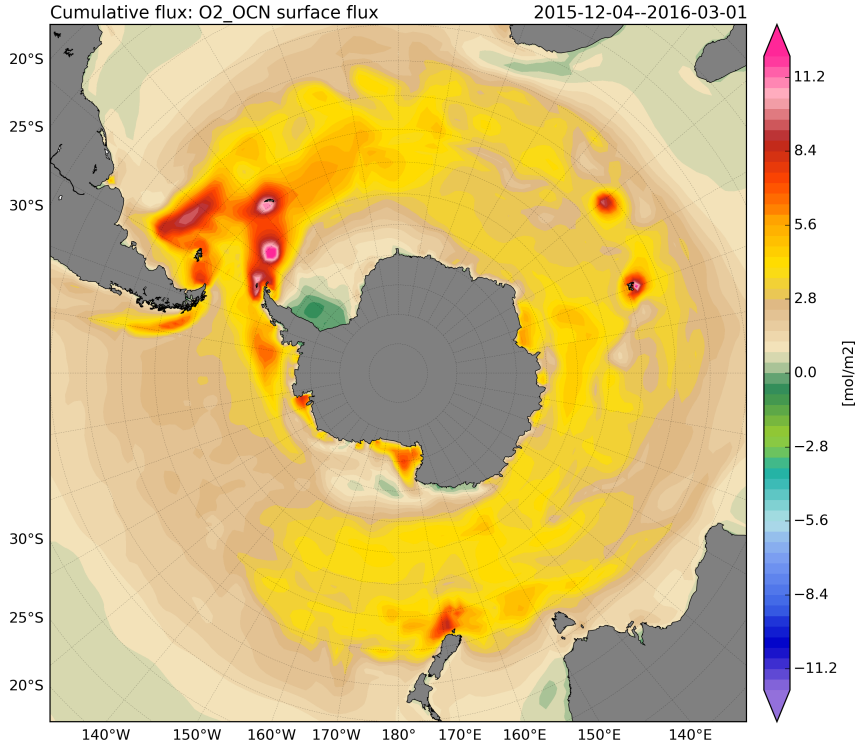
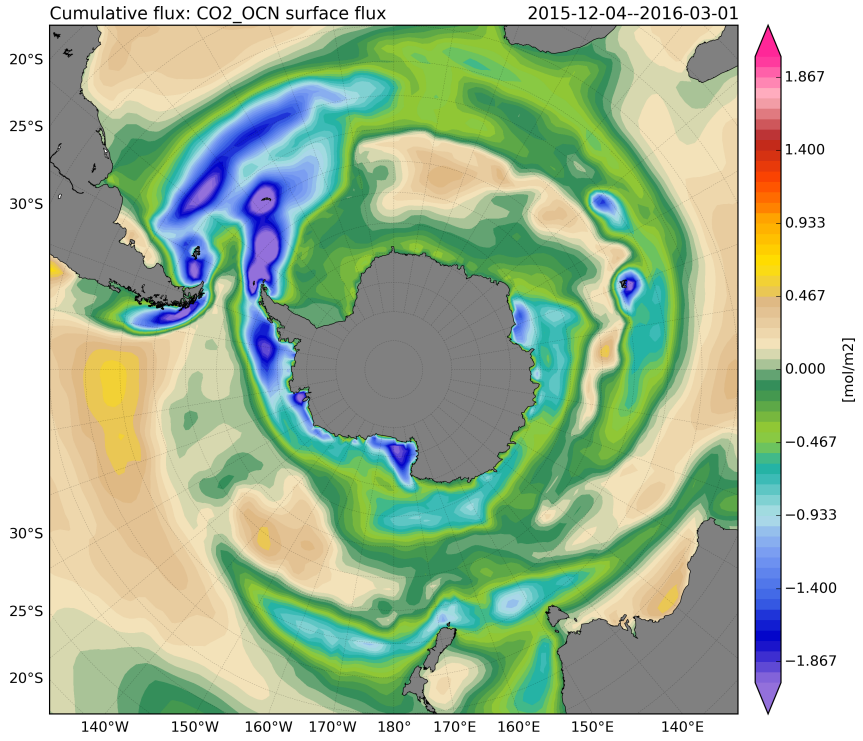
Outline

- Interpreting observed O_2:CO_2 ratios;
- Validation of CESM;
- Decomposition of flux variability.

O_2:CO_2 ratios

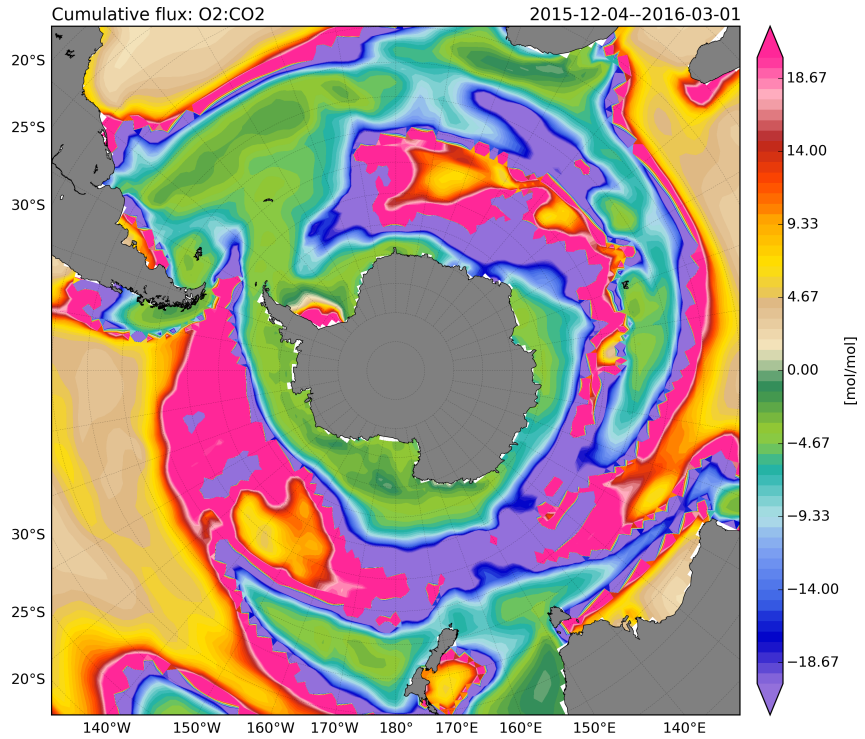
Time-integrated surface fluxes (Dec–Feb)





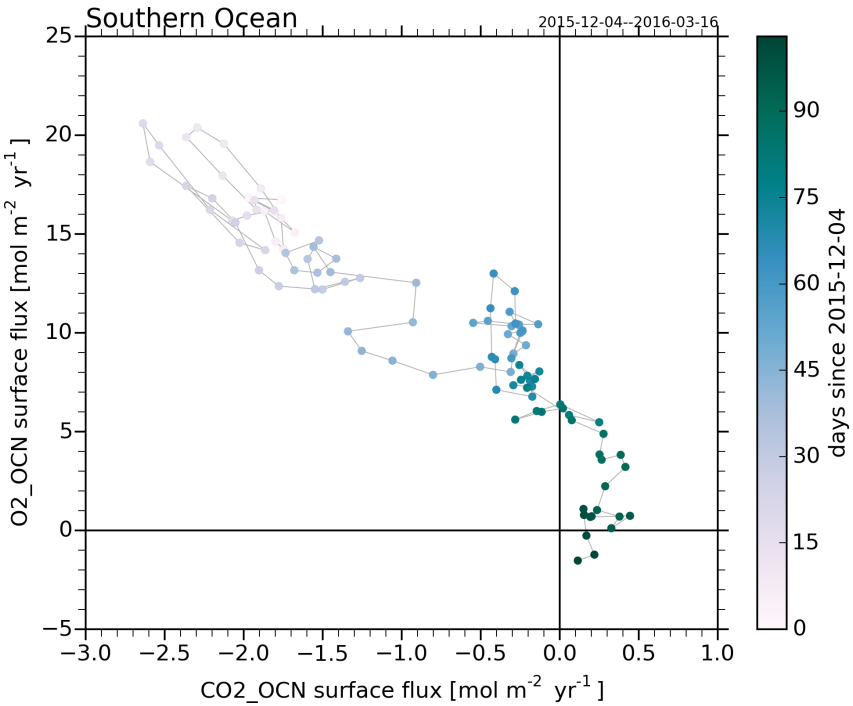
O_2:CO_2 ratios

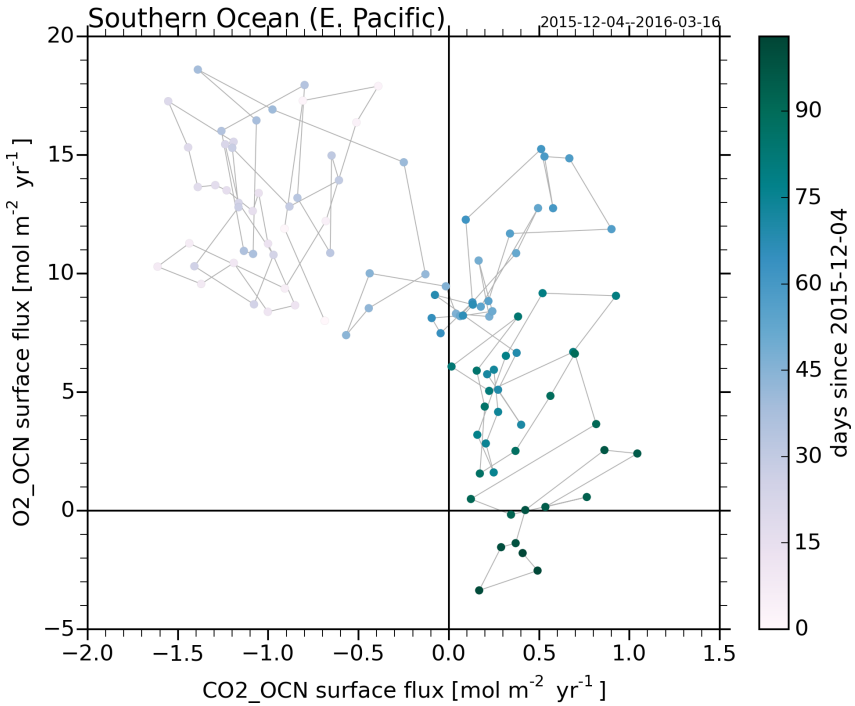
Time-integrated surface flux O_2:CO_2 ratio (Dec–Feb)



O_2:CO_2 ratios

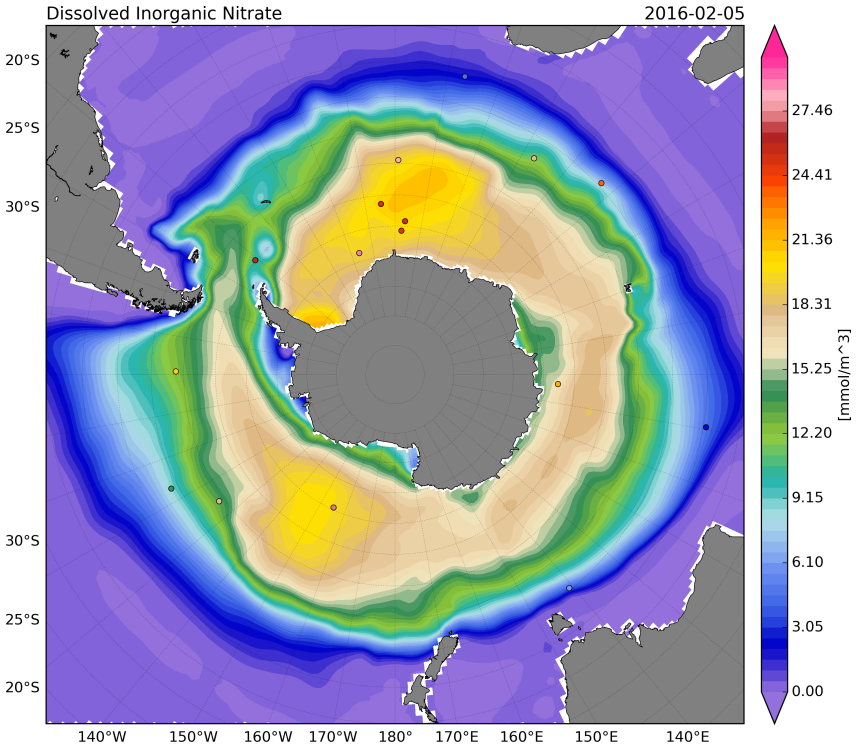
Surface fluxes in phase space (Dec–Feb)





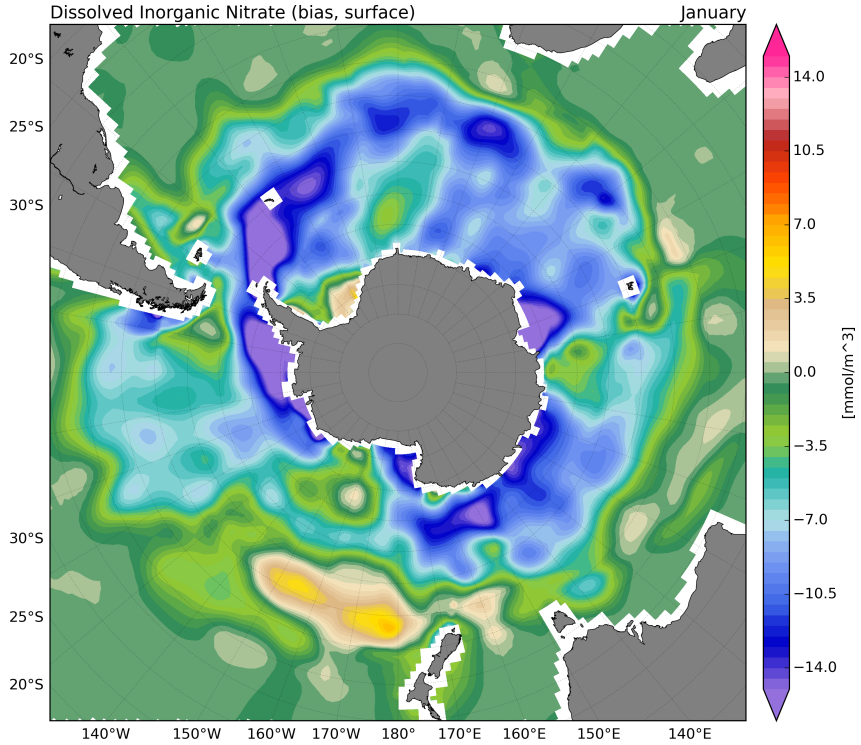
Validation

Surface nitrate



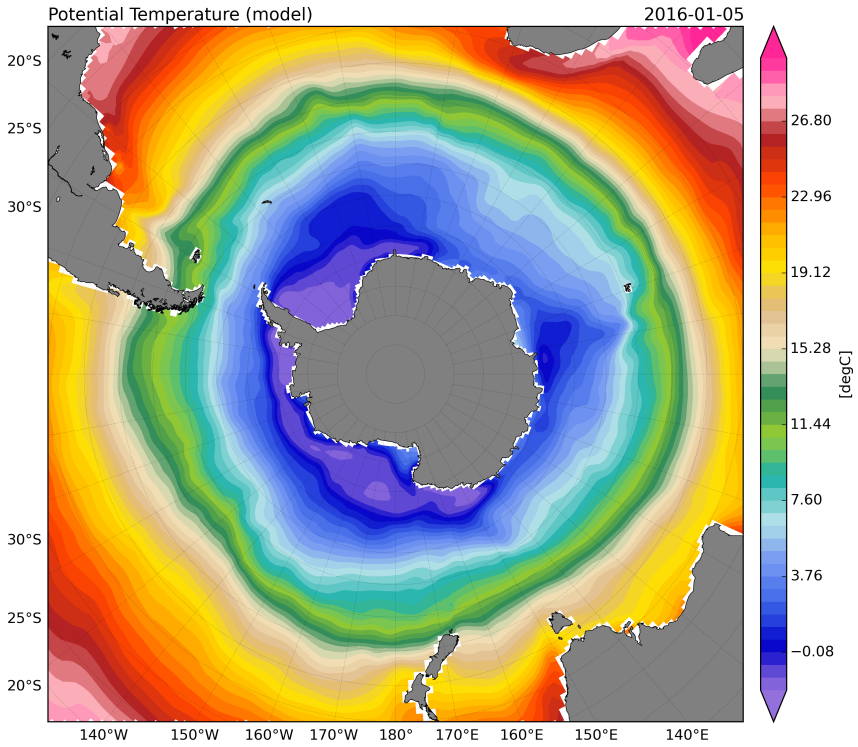
CESM & SOCCOM

Nitrate bias (wrt WOA2013)

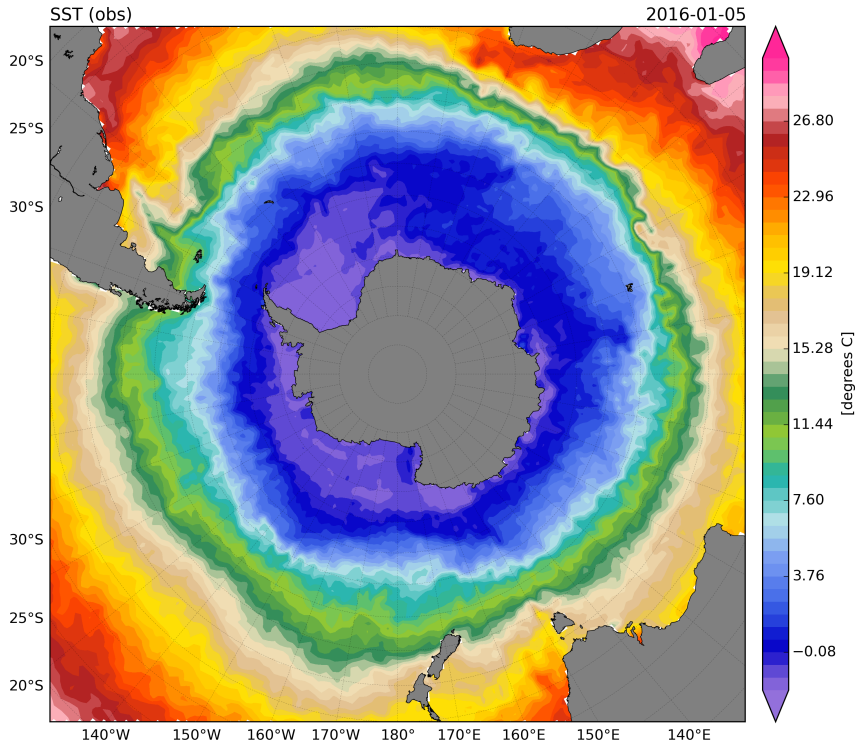


Validation

SST model

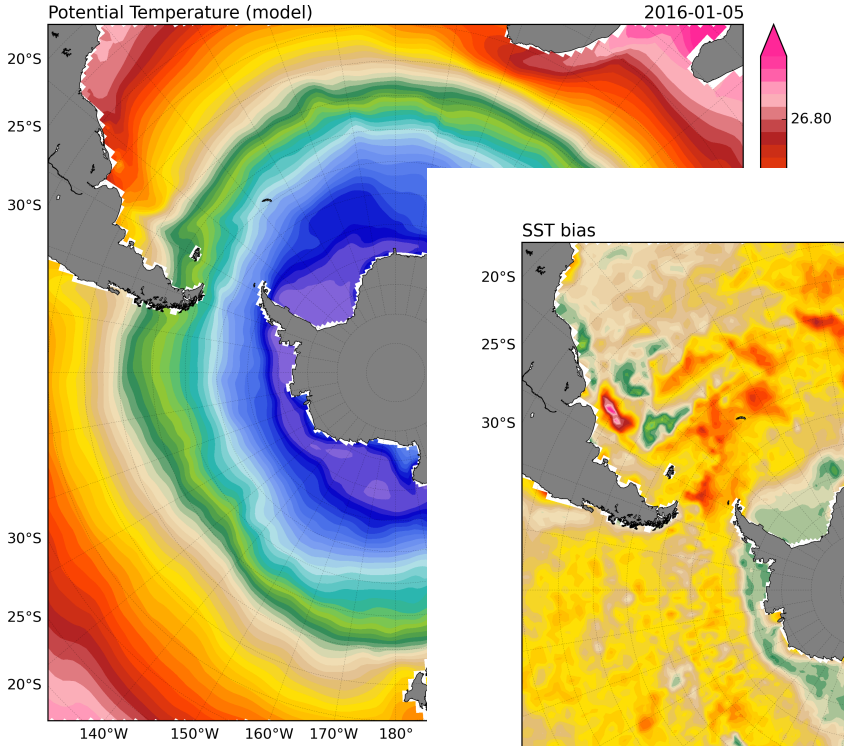


SST observations

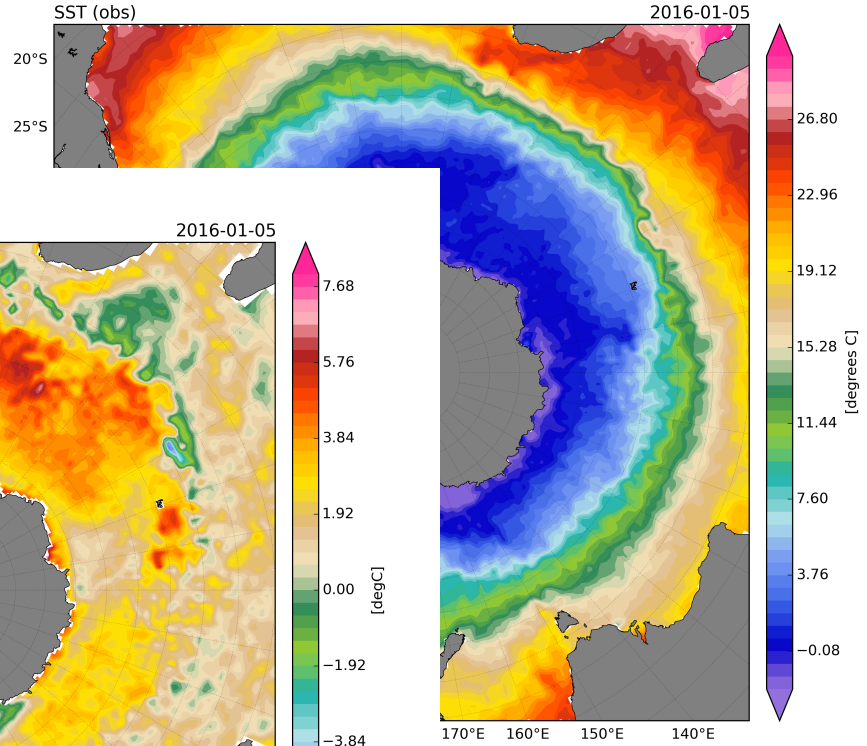


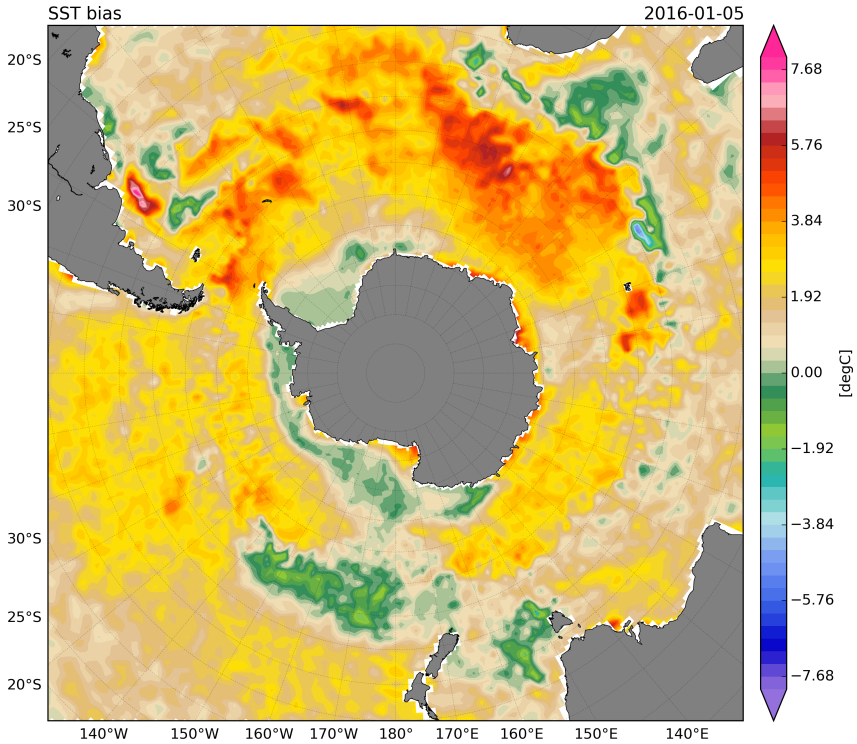
Validation

SST model



SST observations





What is the role of high-flux events in driving seasonal fluxes?

Flux decomposition

Reynold's decomposition

$$c = \overline{c} + c'$$

where

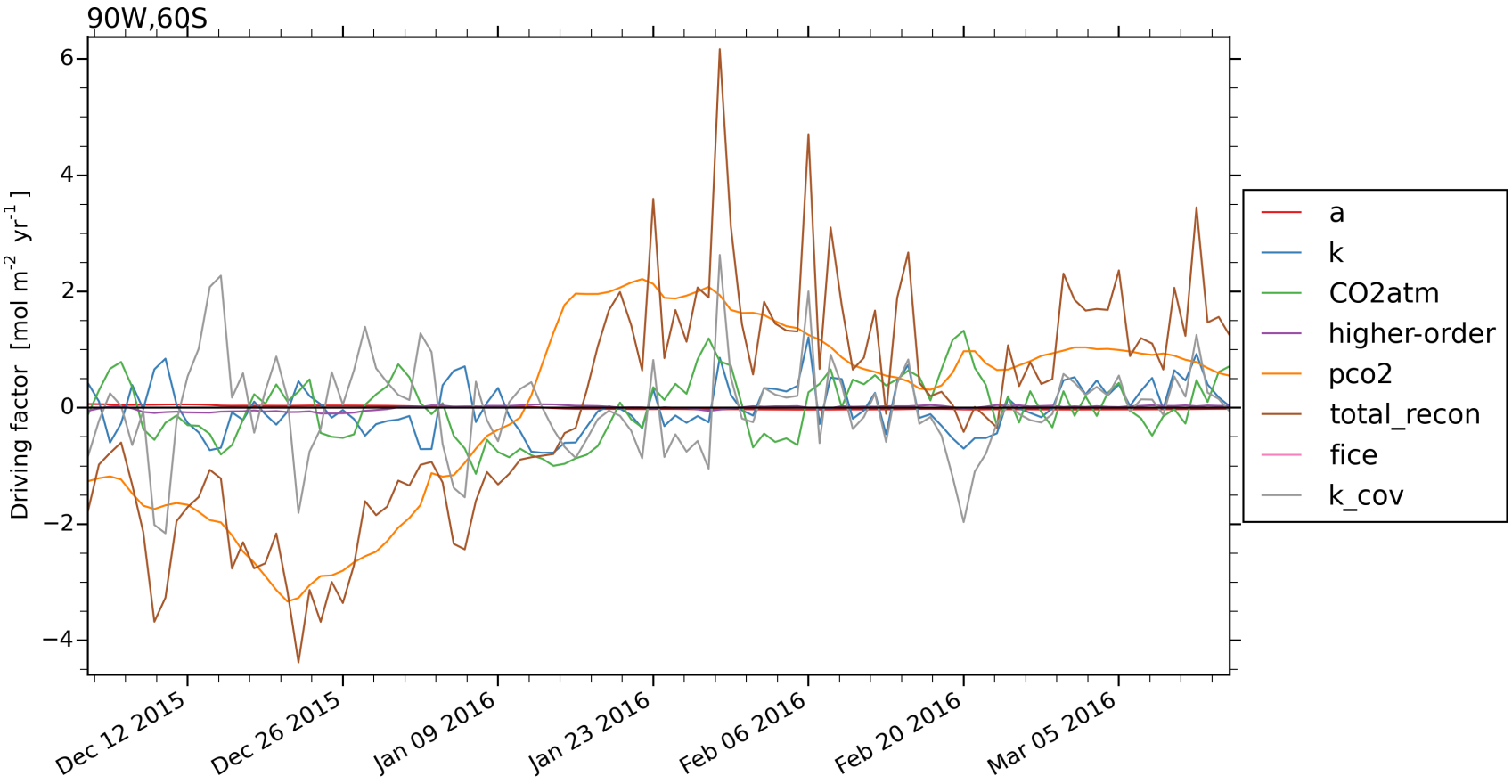
$$\overline{\overline{c}} = \overline{c} \text{ and } \overline{c'} = 0$$

Linear decomposition of anomalies for function of two variables

$$\begin{aligned} F &= AB \\ F' &= (AB)' = AB - \overline{(AB)} \\ &= A'\overline{B} + \overline{A}B' + A'B' + \overline{A'B'} \end{aligned}$$

Flux decomposition

CO_2 flux components (at arbitrary point)



Flux decomposition

O_2 flux components (at arbitrary point)