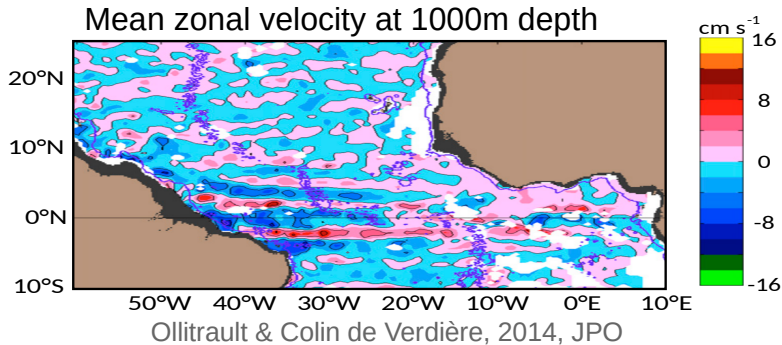
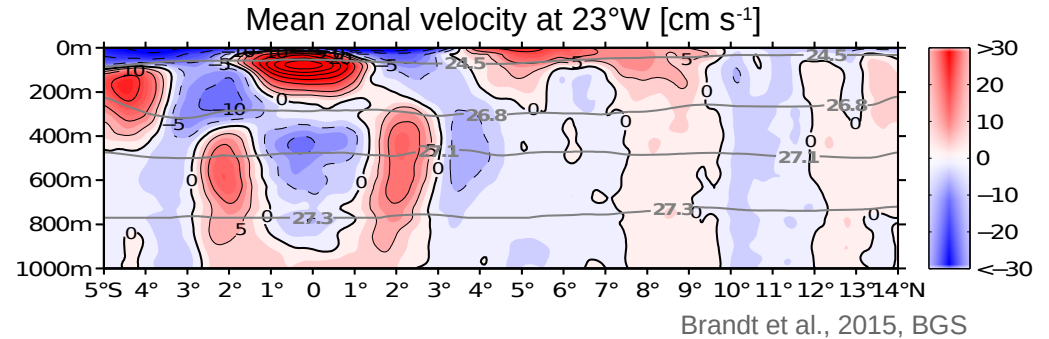
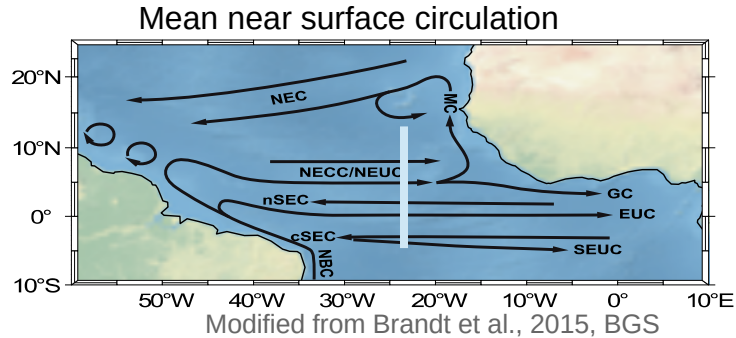


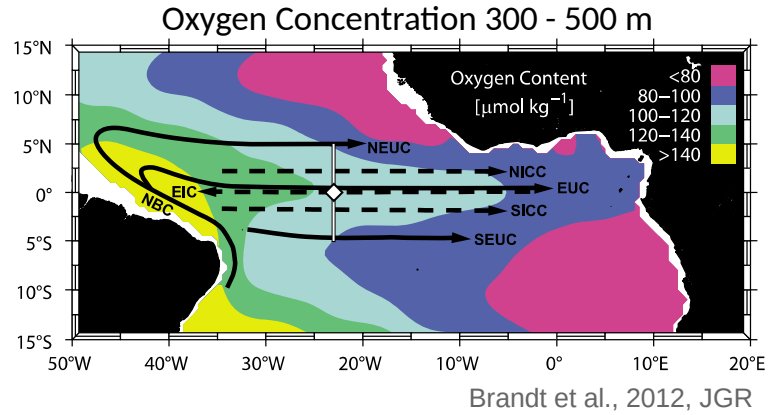
Ocean Deoxygenation, Sep. 3, 2018

Driving mechanisms for maintaining the equatorial deep jets and the quasi-steady flanking jets

M. Claus, R. Greatbatch, P. Brandt

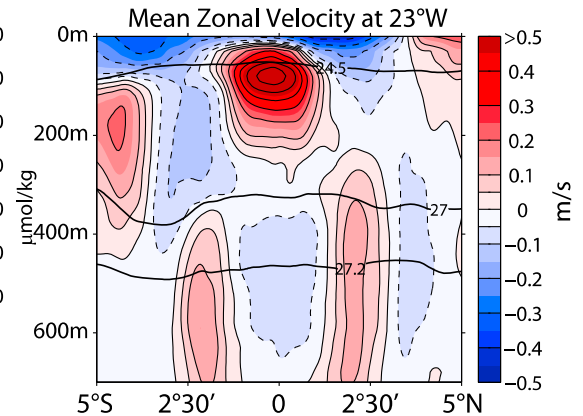
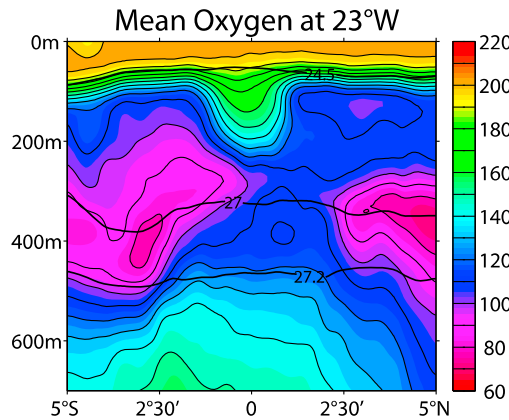


- The mean circulation is characterized by a rich meridional and vertical structure
- Present ocean models have problems to adequately reproduce the mean equatorial circulation, especially below the thermocline



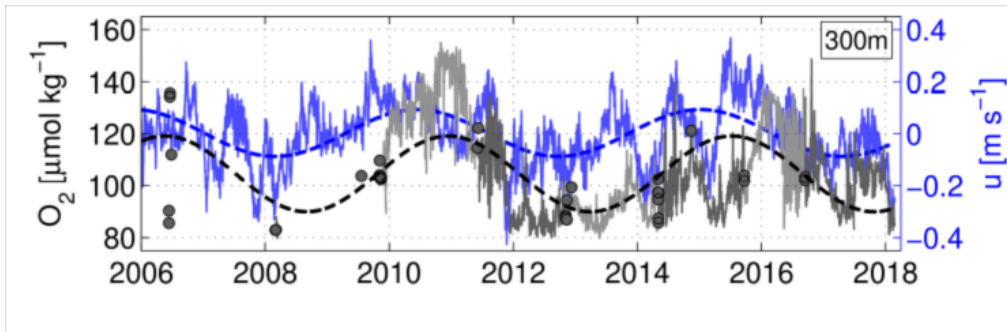
→ The equator allows for significant tracer transport from west to east

→ At depth of the ETNA OMZ core, the oxygen tongue is spreading against the mean flow

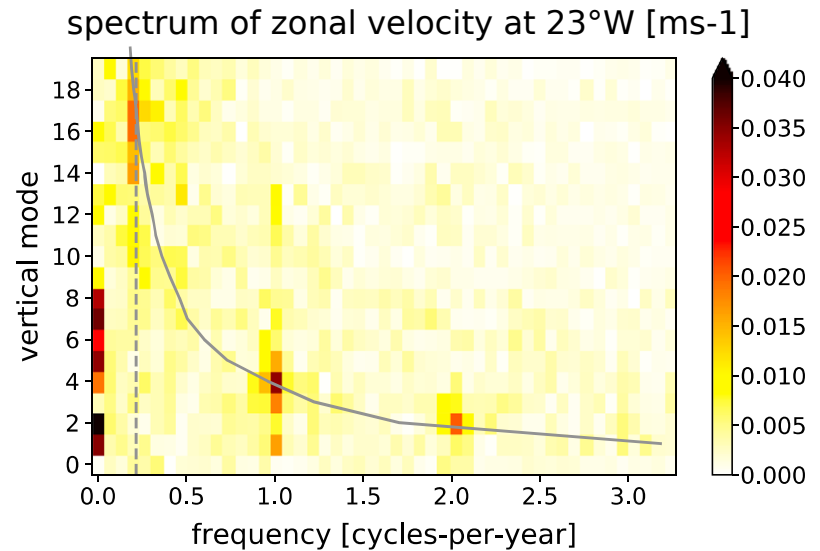


Brandt et al., 2012, JGR

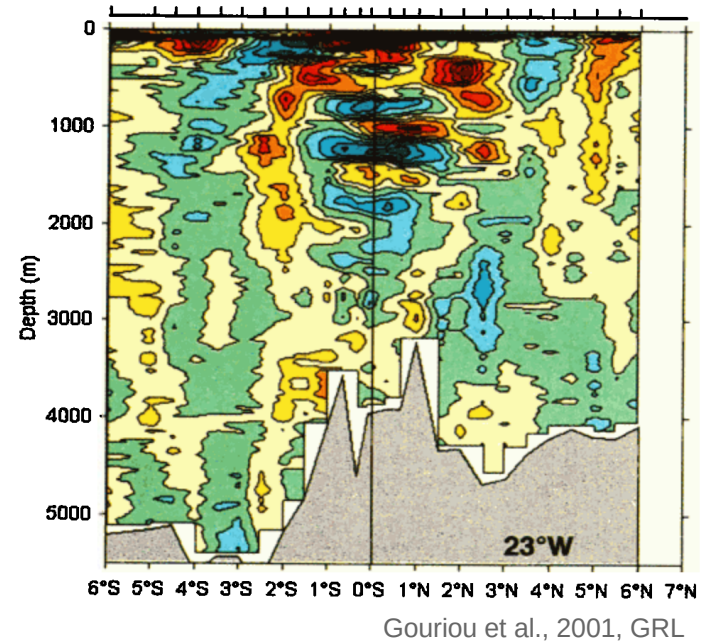
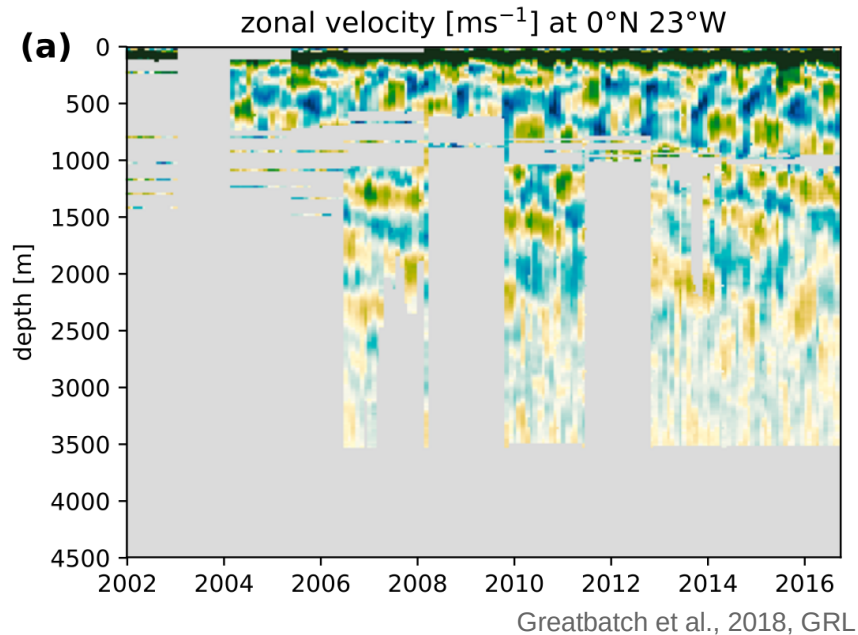
Oxygen concentration and zonal velocity at 0°N 23°W



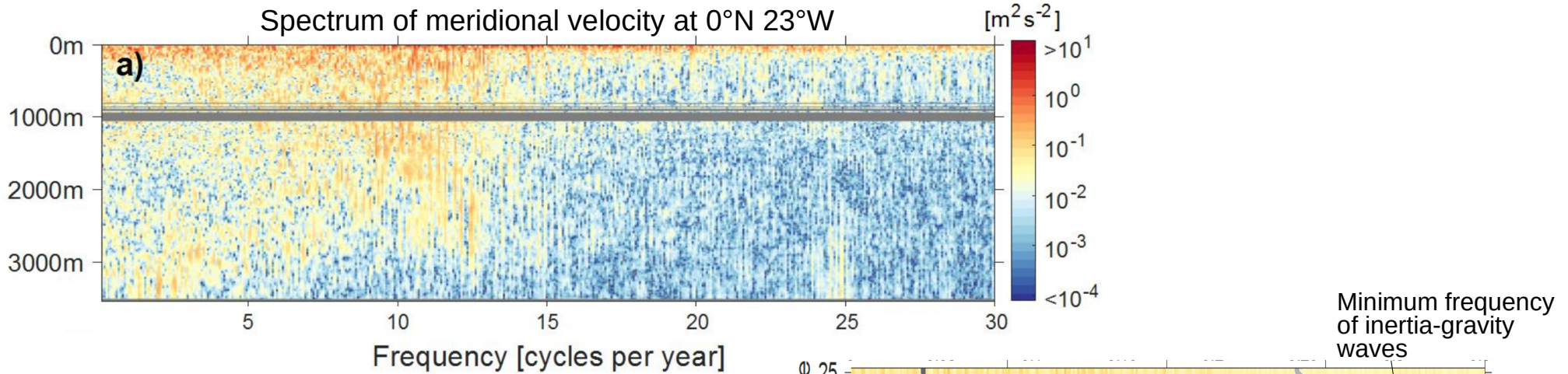
- Pronounced interannual oxygen variability at the same time scale as zonal velocity
- Phase difference suggests net eastward oxygen flux
- Equatorial Deep Jets drive oxygen variability and eastward oxygen flux (Brandt et al., 2012, JGR)



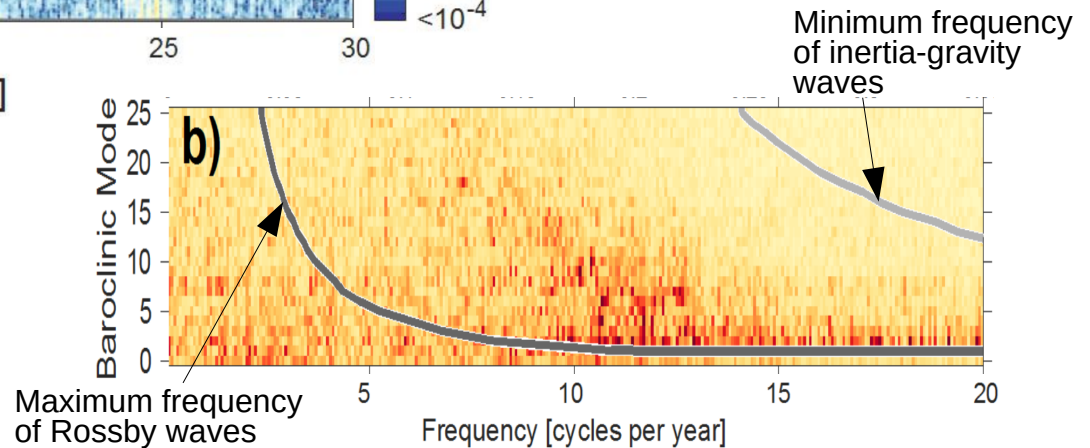
Greatbatch et al., 2018, GRL



- Equatorial Deep Jets are missing in current generation of ocean models
- Intra-seasonal variability is suggested to drive the equatorial deep jets (Hua et al., 2008, JFM; Ascani et al., 2015, JPO; Greatbatch et al., 2018, GRL)

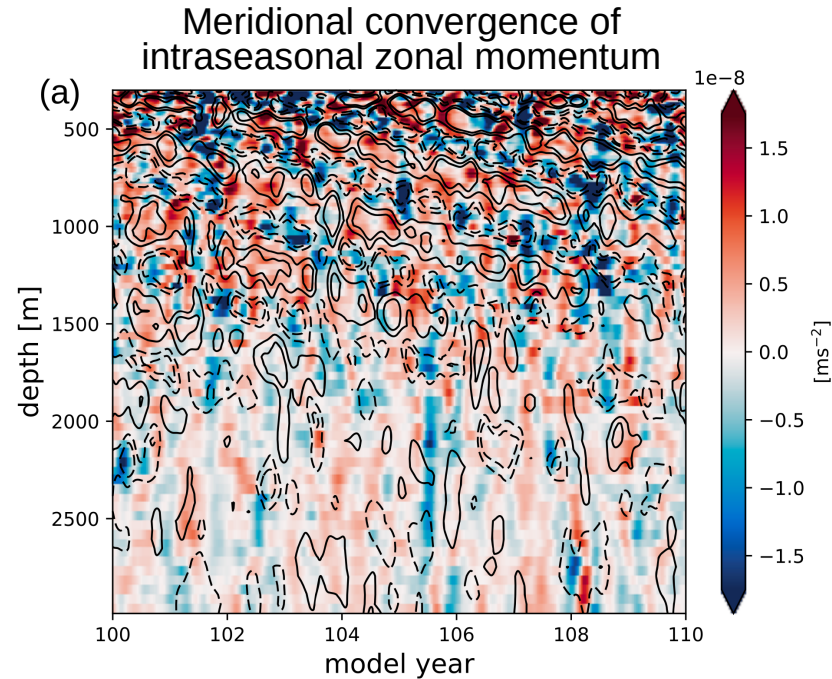
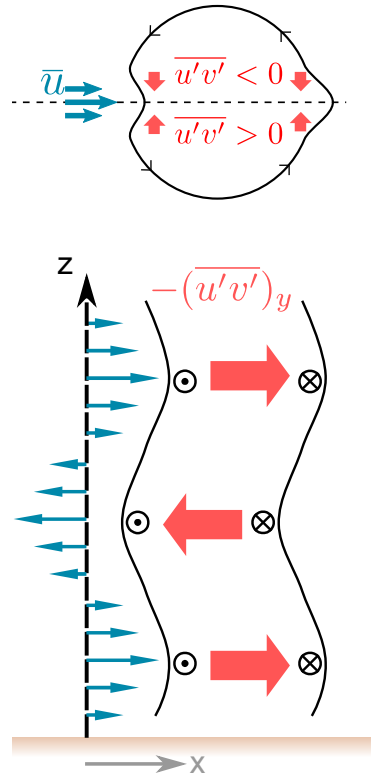


- Elevated levels of intra-seasonal variability at depth
- Variability is associated with large vertical scale Yanai waves
- Possibly generated by TIW west of 23°W or at the western boundary (Tuchen et al., under revision)



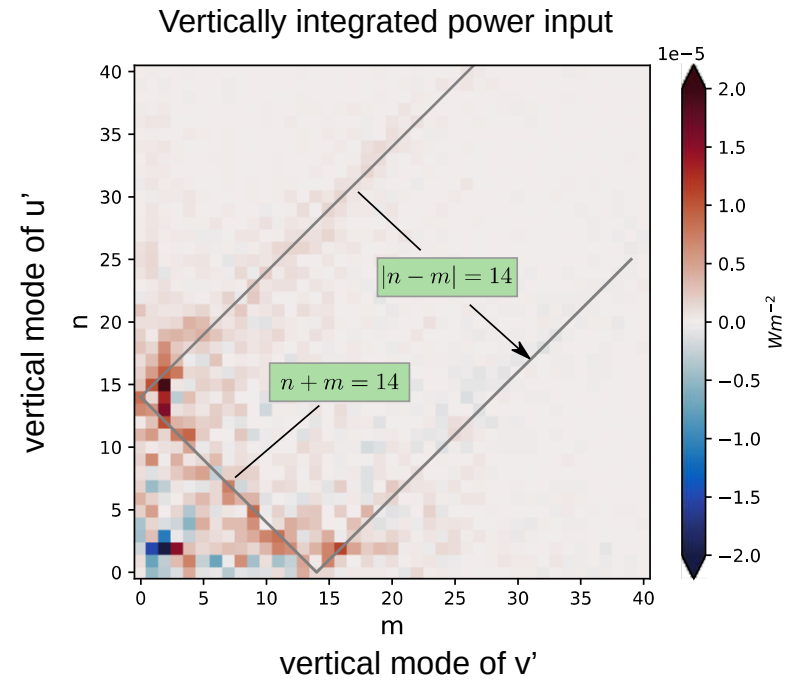
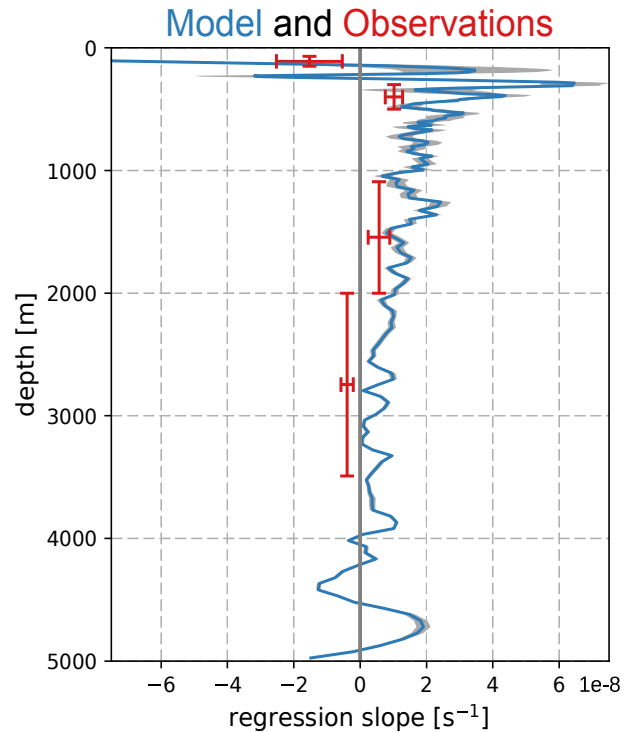
Tuchen et al., submitted to JPO

Momentum transfer from intra-seasonal to interannual variability



Greatbatch et al., 2018, GRL

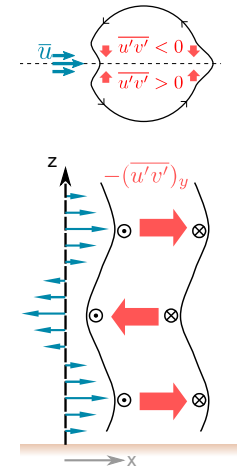
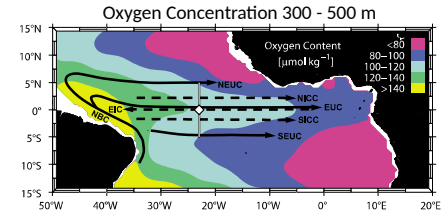
- Momentum flux convergence accelerates low frequency variability



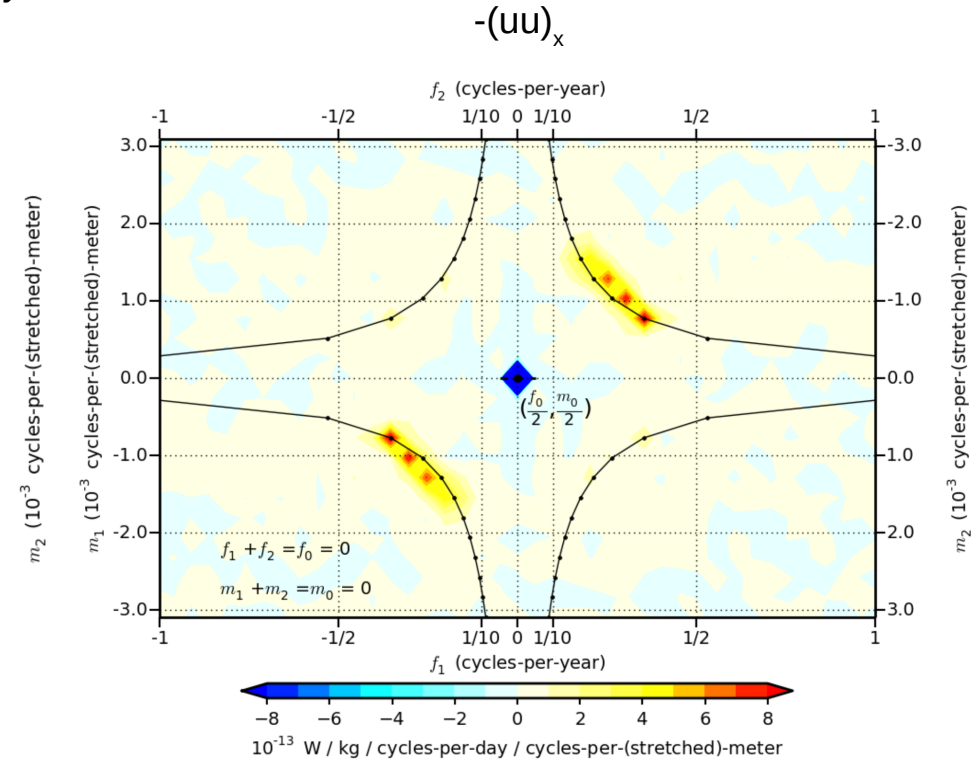
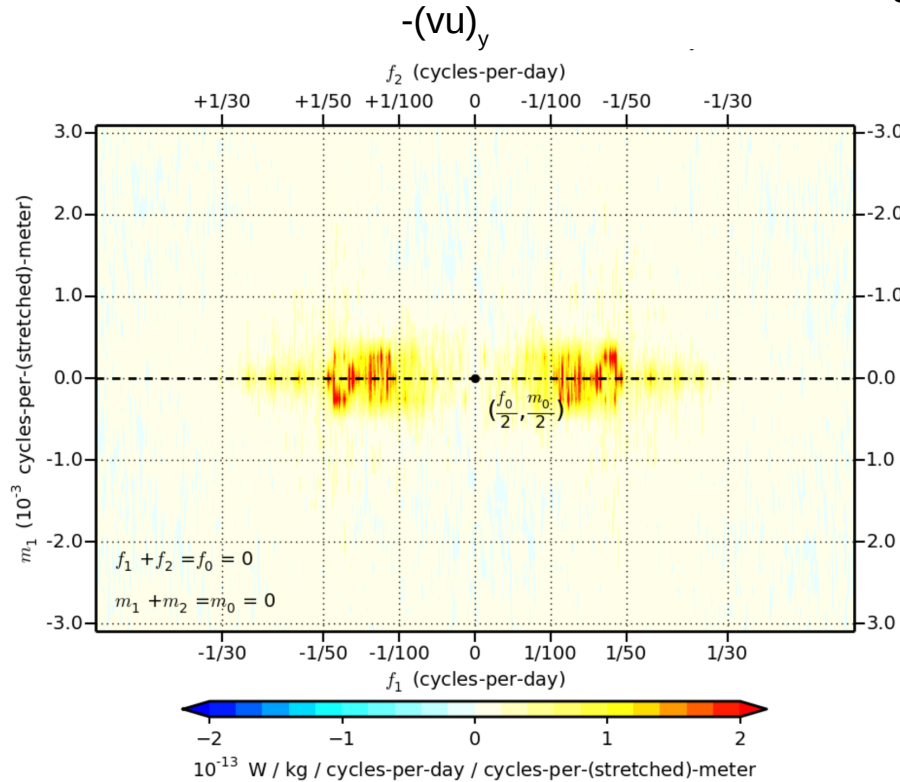
Greatbatch et al., 2018, GRL

- Combination of small vertical scale u' and large vertical scale v' do most work

- The equator is an exceptional location since it allows for significant eastward transport of tracer
- Equatorial mean circulation and its low-frequency variability is not well represented by current generation ocean models
- The Equatorial Deep Jets are maintained by the meridional convergence of intra-seasonal zonal momentum
- Intra-seasonal variability and the Equatorial Deep Jets flux energy to the mean circulation (Ascani et al., 2015, JPO)
- To improve the tracer distribution in models, both the mean equatorial circulation and its variability on short and long time scales must be adequately represented.



Nonlinear energy transfer to LEIC via



Ascani et al., 2015, JPO

Model setup

- MITgcm, z-coordinate
- $1/4^\circ \times 1/4^\circ$, 200 level
- Uniform salinity, linear EOS
- flat bottom, free-slip BBC, no-slip LBC
- Vertical mixing: Pacanowski and Philander (1981)
- Driven by zonally uniform **steady wind stress**
- Velocity decomposition with 70-day cut-off

$$u = u_0 + \bar{u} + u'$$

