Deep Intraseasonal Variability in the Central Equatorial Atlantic

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PREFACE Final Assembly
17.-19.04.2018, Lanzarote, Spain
Variability of the Equatorial Atlantic

by courtesy of Martin Claus

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Meridional velocity observations

Energy source(s)?
Propagation mechanism?
Almost 16 years of velocity data from an equatorial mooring at 23°W
Gaps in the data coverage introduce uncertainty
High kinetic energy close to the surface $\rightarrow$ downward propagation
Seasonal cycle of TIWs

- Consistent annual maximum in boreal summer (August)
- Remarkable year-to-year variations of the annual intensification
- Weaker maximum in boreal winter (January)
DEIV in the central Atlantic Ocean
Equatorial waves

Guiavarc'h et al. (2008)

Gravity waves

Yanai waves

Rossby waves

Kelvin waves

Frequency $\omega$ (s$^{-1}$)

Wavenumber $k$ (m$^{-1}$)

$1^{\text{st}}$ mode
$2^{\text{nd}}$ mode
$3^{\text{rd}}$ mode
Modal decomposition of $u$ and $v$

- **U**
  - only Kelvin waves

- **V**
  - only Yanai waves

- **Rossby waves**

- Gravity waves

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Yanai beams – energy pathways

Upward phase propagation
Downward energy propagation

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Conclusions

• At the equator: intraseasonal variability is observed down to 2000 m

• A modal decomposition shows that mainly Yanai waves are responsible for the observed variability

• Intraseasonal wave energy is propagated east- and downward along Yanai beams
Different Yanai wave periods and modes
Seasonal cycle of TIWs

![Diagram showing the seasonal cycle of TIWs with kinetic energy values from January to December.](image)
Spectrum of near-surface $\mathbf{v}$
Zonal velocity at 23°W / 0°N

Downward phase propagation
Upward energy propagation