Odd **E**quatorial **W**ind **R**eversals

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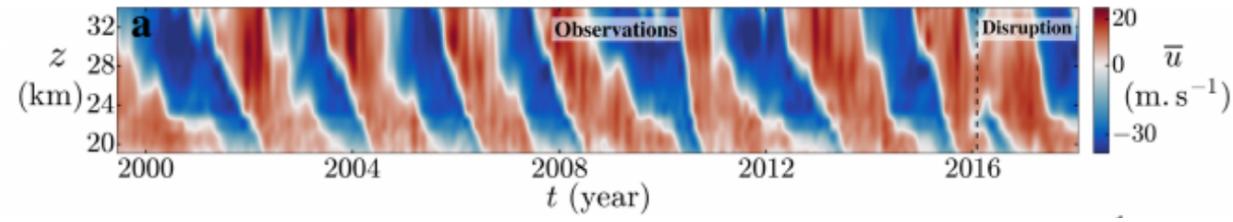
Master 2 internship - PhD 2019



In the Earth's atmosphere, fast propagating equatorial waves generate slow reversals of the large scale winds every 28 months (image above). This quasi-biennial oscillation is the hallmark of wave-mean flow interaction in stratified fluids, with analogues in laboratory experiments, other planetary atmospheres, and even star interiors. Up to now, it was presented as the clearest case of spontaneous emergence of a periodic large scale flow in geophysics. Yet, recent observations reported a disruption of this periodic behavior. This has immediatly triggered a surge of work on the subject, from geophysics to nonlinear dynamics [1,2]. In particular, a quasi-periodic route to chaos has been found in simplified atmospheric models [3], demonstrating the possibility for strong intrinsic variability in stratified fluids (figure 1). There is however a gap between these simplified models and actual atmospheric flows. The aim of the internship will be to bridge an essential part of this gap, by exploring how the transition to chaos is affected by Earth's rotation. At longer term, we intend to search for similar bifurcations in oceanic equatorial jets. It will be possible to develop both theoretical and numerical aspects of the project, in collaboration with L.-P. Nadeau at Rimouski, Québec.

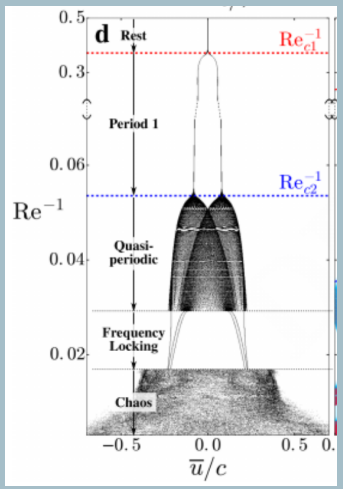


Figure 1: Quasi-periodic route to chaos in simplified model for atmospheric winds reversals at the equator [3].

Références:

[1] *P. Read* 2018, *Chorus of the winds*, GRL

[2] *L. Couston et al* 2018, PRL, Physics Focus

[3] *A. Renaud, L.-P. Nadeau, A. Venaille* 2018, sub. to PNAS

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