

# Flows in rotating fluids: modal acoustic velocimetry in the ZoRo experiment

Master internship proposal 2021

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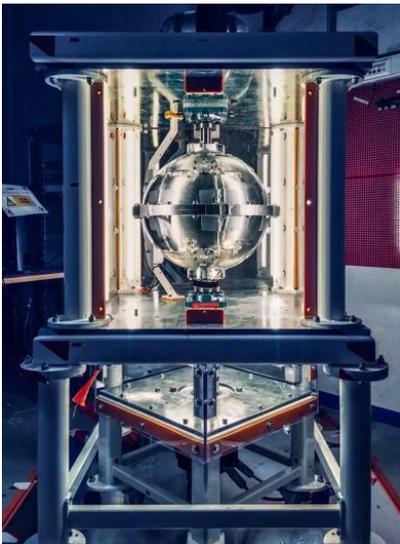
The ZoRo experiment has been built for the study of **Zonal** flows in rapidly **Rotating** fluids. Such flows are dominant in the atmosphere of giant planets, and could also exist in planetary liquid cores. Experiments are needed to shed light on the mechanisms leading to the formation of these jets. In such experiments, classical velocity techniques using tracers, such as PIV, cannot operate, owing to the strong centrifugal acceleration. Instead, we are using the *modal acoustic velocimetry* technique proposed by Triana et al (2014).

The experiment and several modelling and data processing tools have been built during the PhD thesis of Sylvie Su, who studied the effect of the Coriolis force on the acoustic modes (Su et al, 2020), and retrieved profiles of simple zonal flows. The internship candidate will learn how to run the ZoRo experiment and make use of the different tools. He/she will investigate the zonal flows generated by longitudinal librations of the gas-filled spheroid.

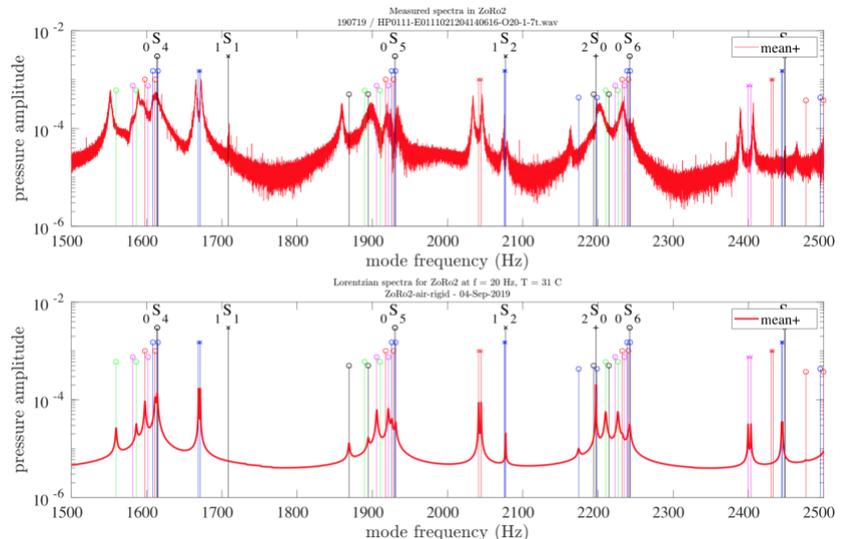
## References:

Helioseismology in a bottle : Modal acoustic velocimetry, Triana S.A., D.S. Zimmerman, H.-C. Nataf, A. Thorette, V. Lekic and D.P. Lathrop, *New Journal of Physics*, **16**, 113005, 2014.

Acoustic spectra of a gas-filled rotating spheroid, Su S., D. Cébron, H-C. Nataf, P. Cardin, J. Vidal, M. Solazzo & Y. Do, *European J. Mech. B/Fluids*, **84**, 302-310, 2020.



Photograph of the ZoRo experiment at ISTERre.



An example of recorded and synthetic acoustic spectra from the ZoRo experiment.