NSTX

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XP830: RWM Stabilization Physics

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and the NSTX Research Team

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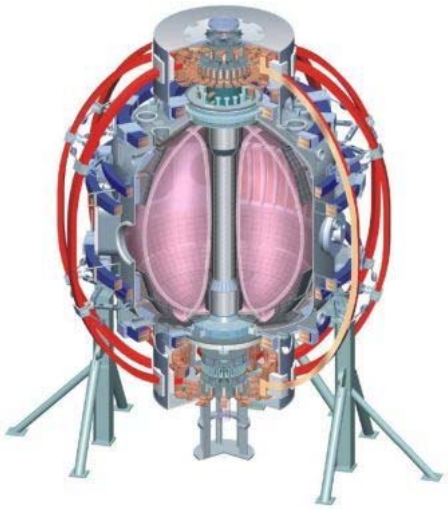

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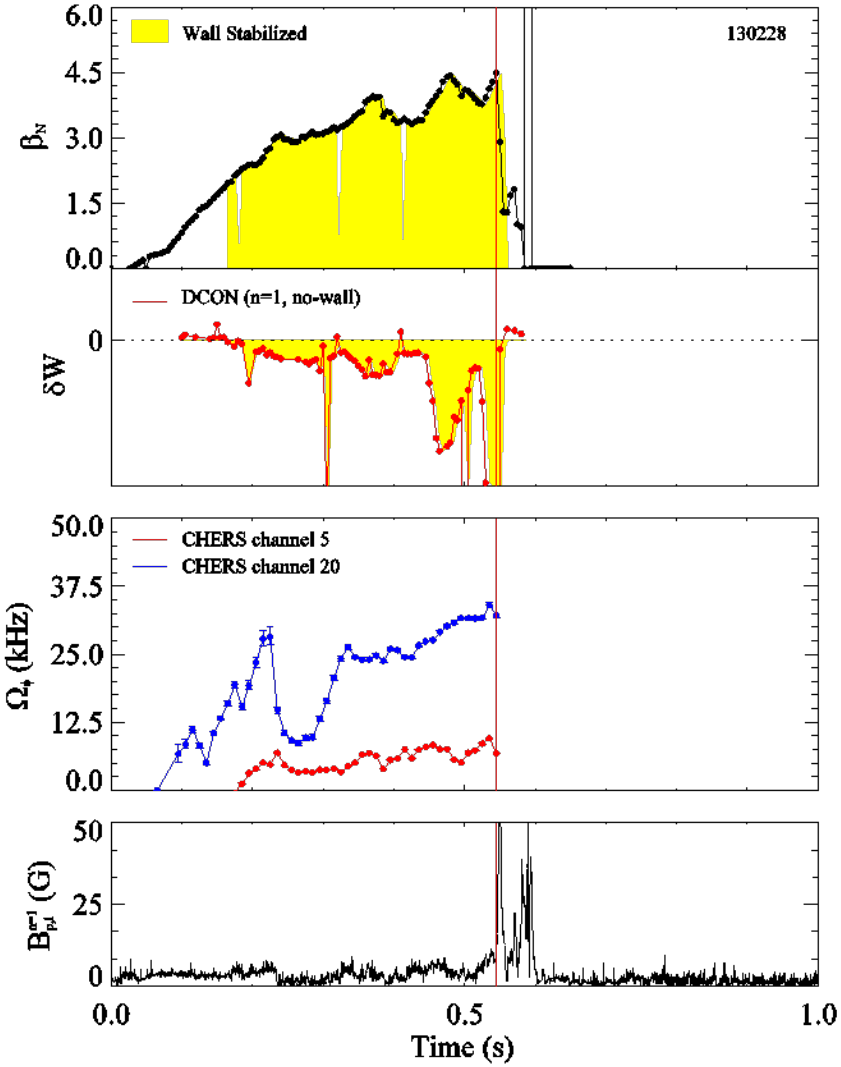
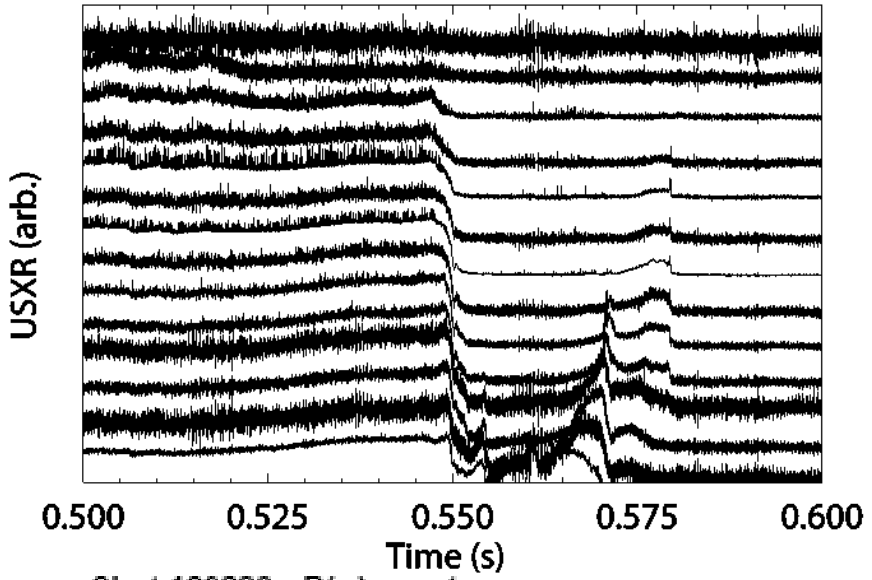
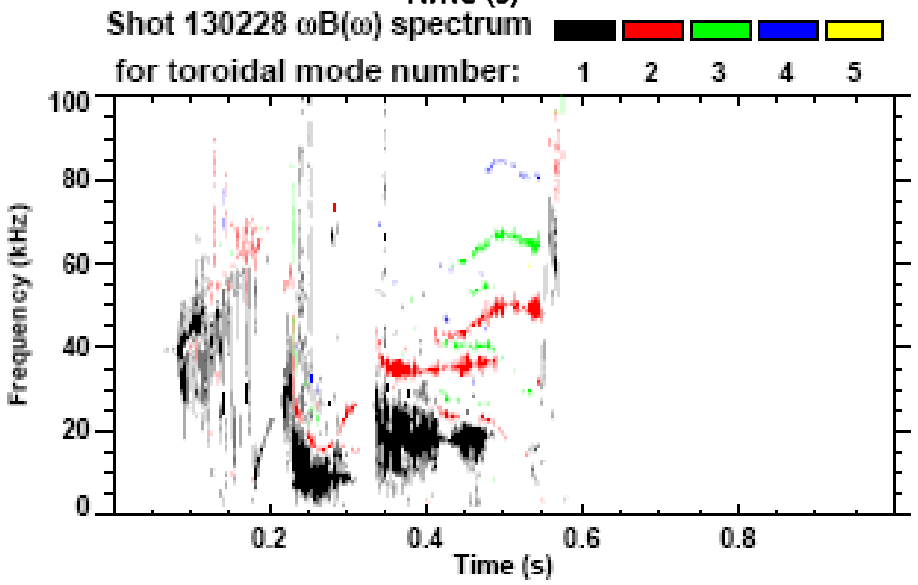
Overview

- XP830 Goal:
  - Test the effectiveness of kinetic dissipation in stabilizing the RWM in NSTX by varying ion collisionality and rotation profile.
  - Make comparisons to a similar experiment in DIII-D.
- Accomplished:
  - 1.5 days of experimental run time (4/24 and 6/27)
    - 13 RWMs observed in 51 shots
  - A wide range of rotation profiles was created.
    - 15 – 30 kHz core rotation
  - Collisionality did not change as much as hoped, using pre/post Li shots.
    - Small change in the profile shape near the edge?
  - A complementary XP was not run on DIII-D this year, but comparison to previous DIII-D data continues.

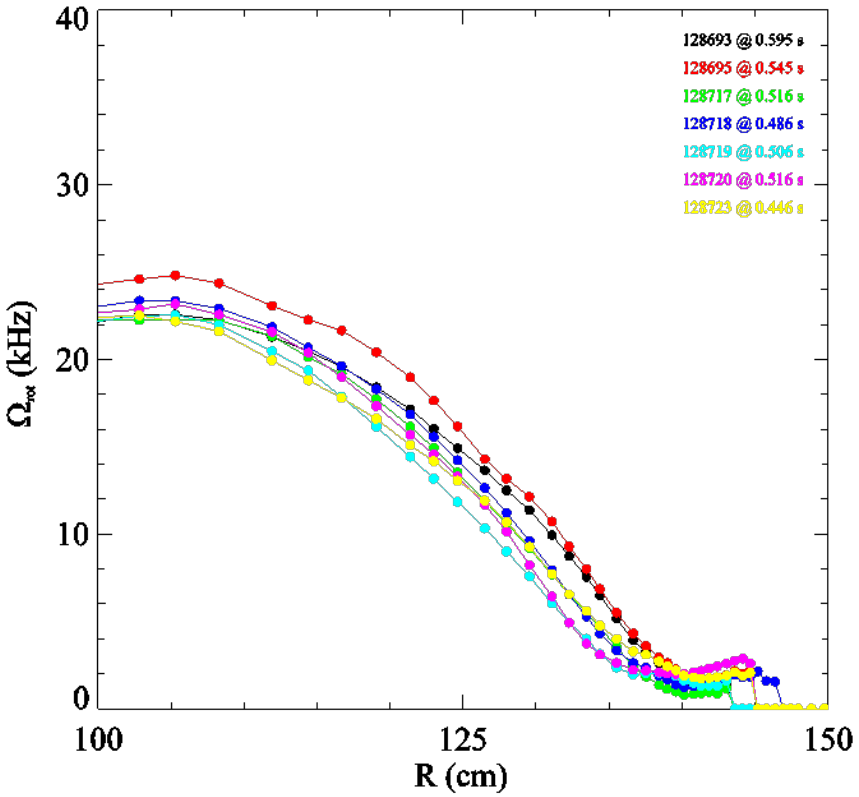
RWM identification

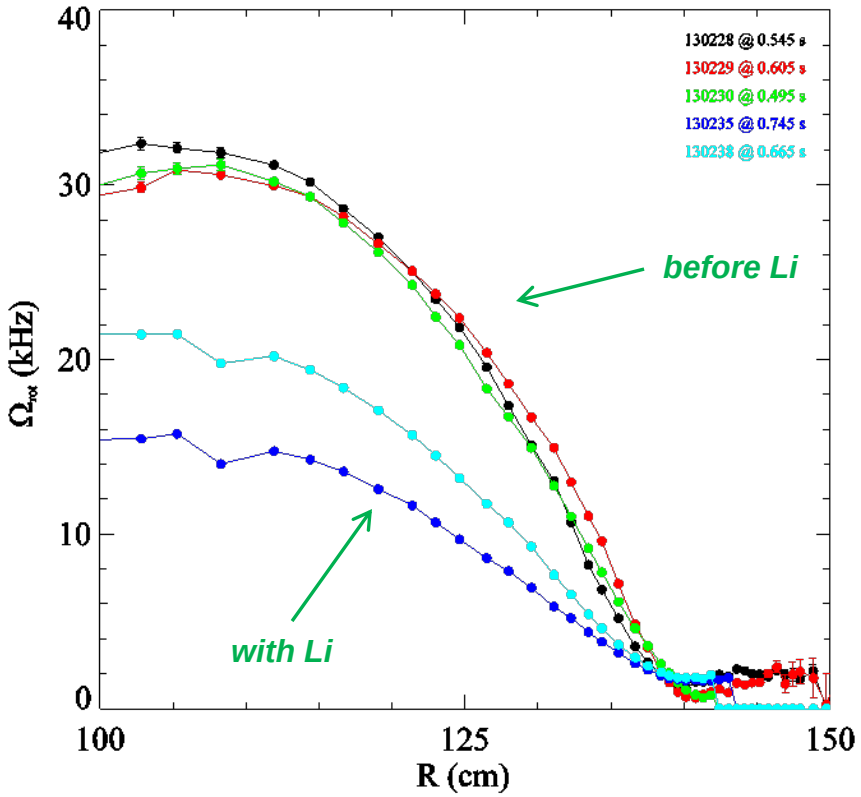






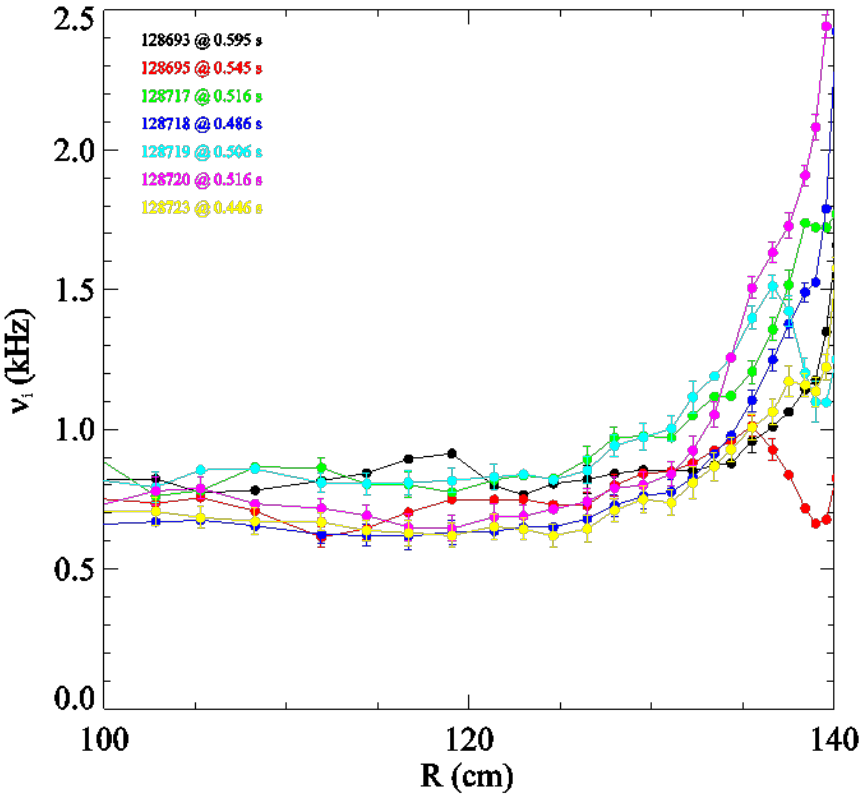
Wide range of rotation profiles at RWM instability time (t_{crit})

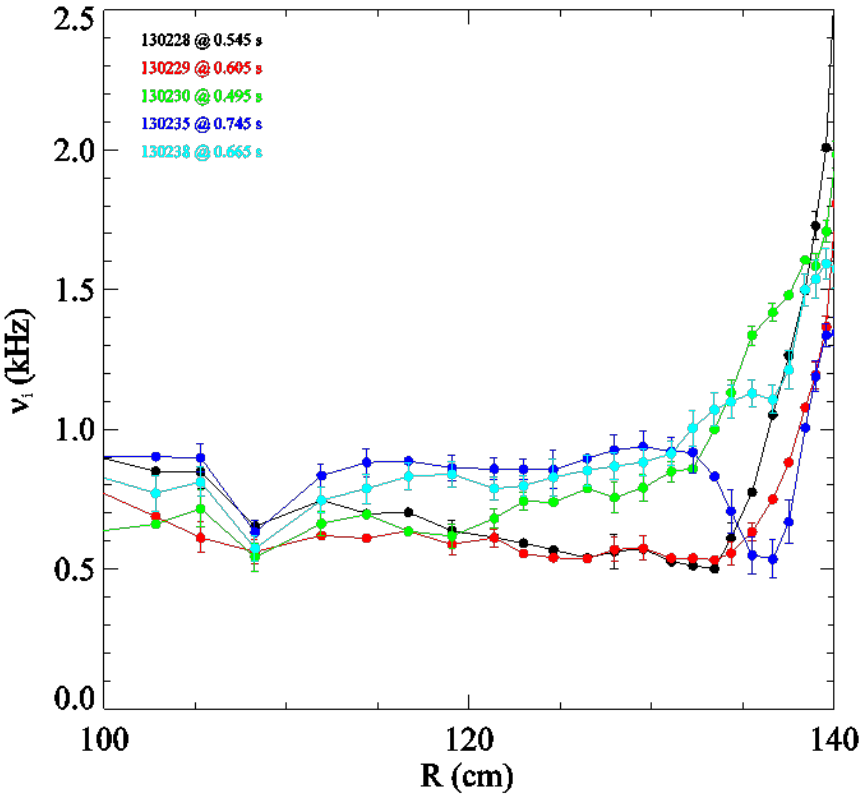




- First day:
  - Medium rotation at t_{crit}.
- Second day:
  - High and low profiles at t_{crit}.

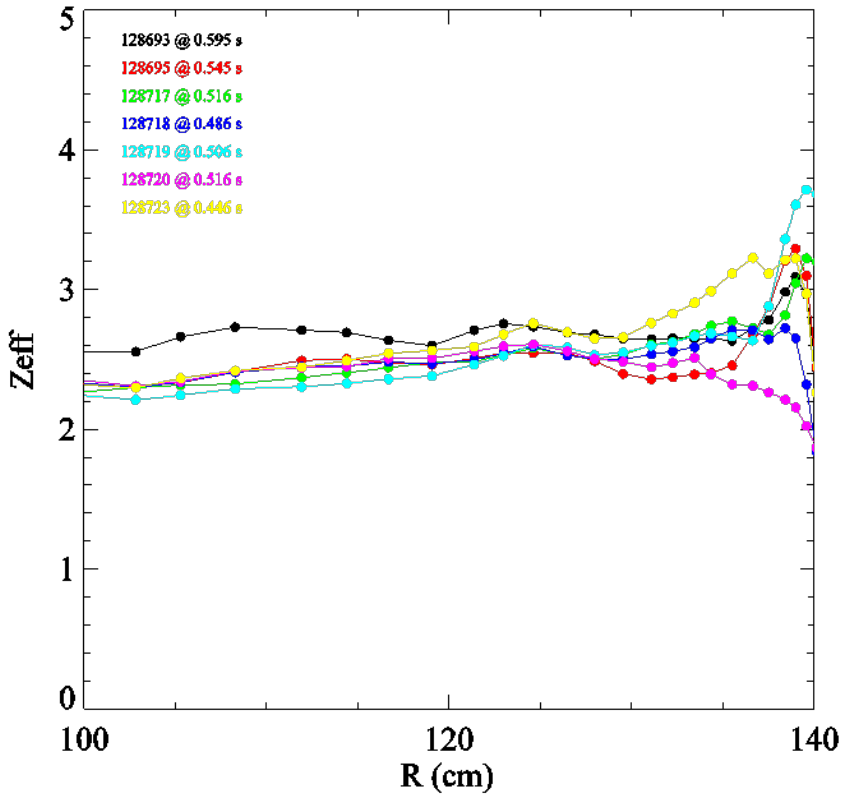
Collisionality doesn't change much, except near the edge

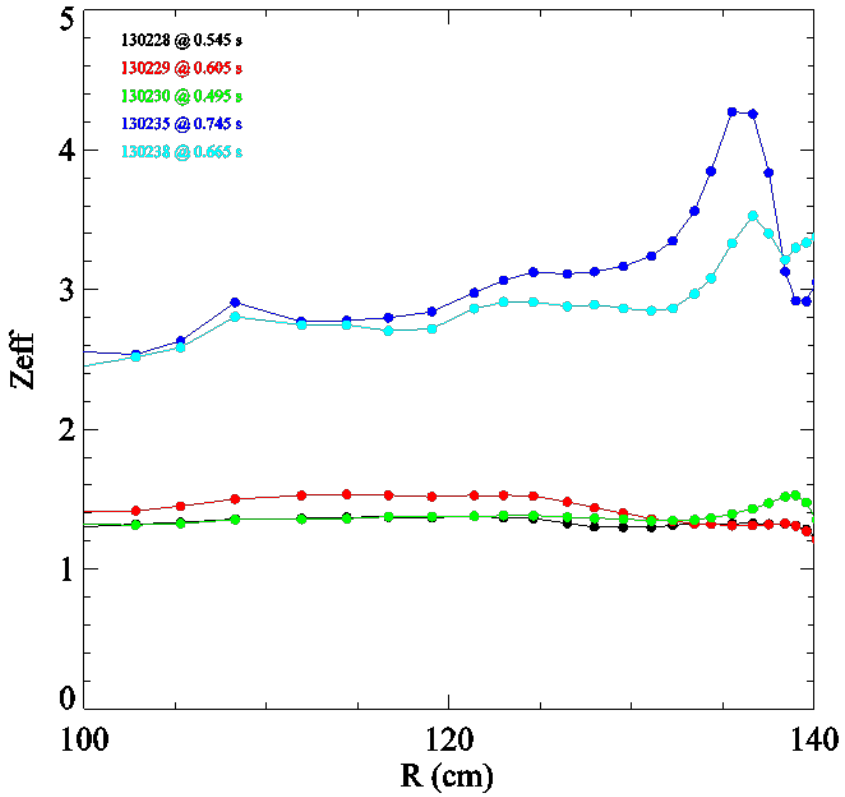




- The change in collisionality seems insufficient to explain the change in rotation at t_{crit}.

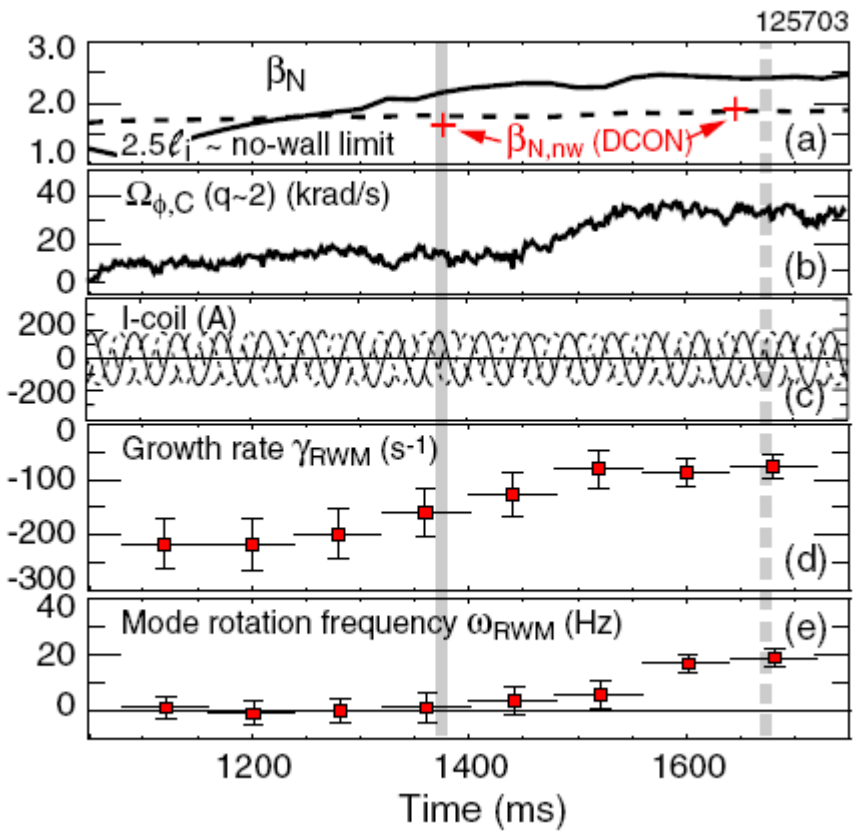
There is a large difference in Z_{eff} (due to Carbon)





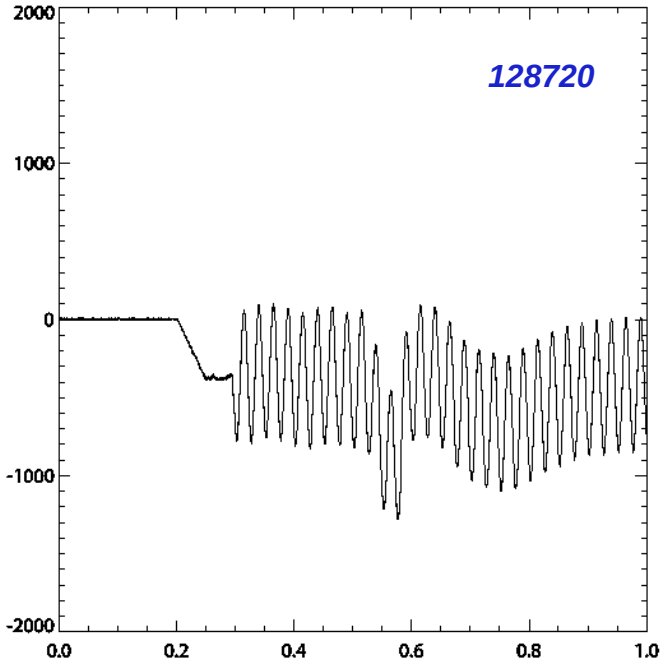
- Is there a better way to treat collisionality in the theory?

Active MHD spectroscopy was also performed (but not yet analyzed)

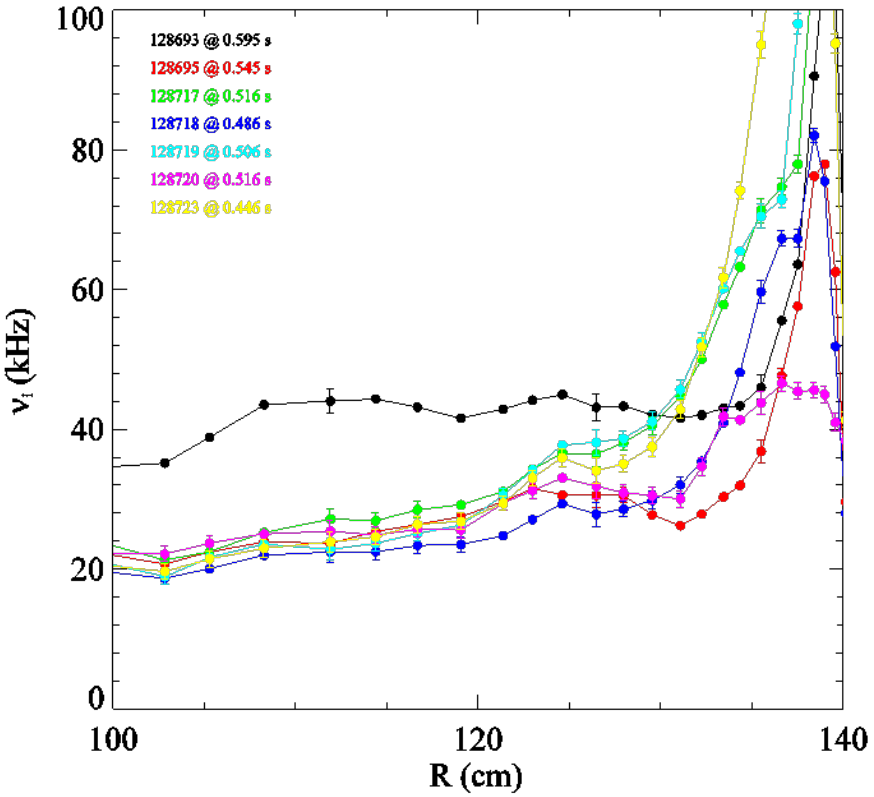


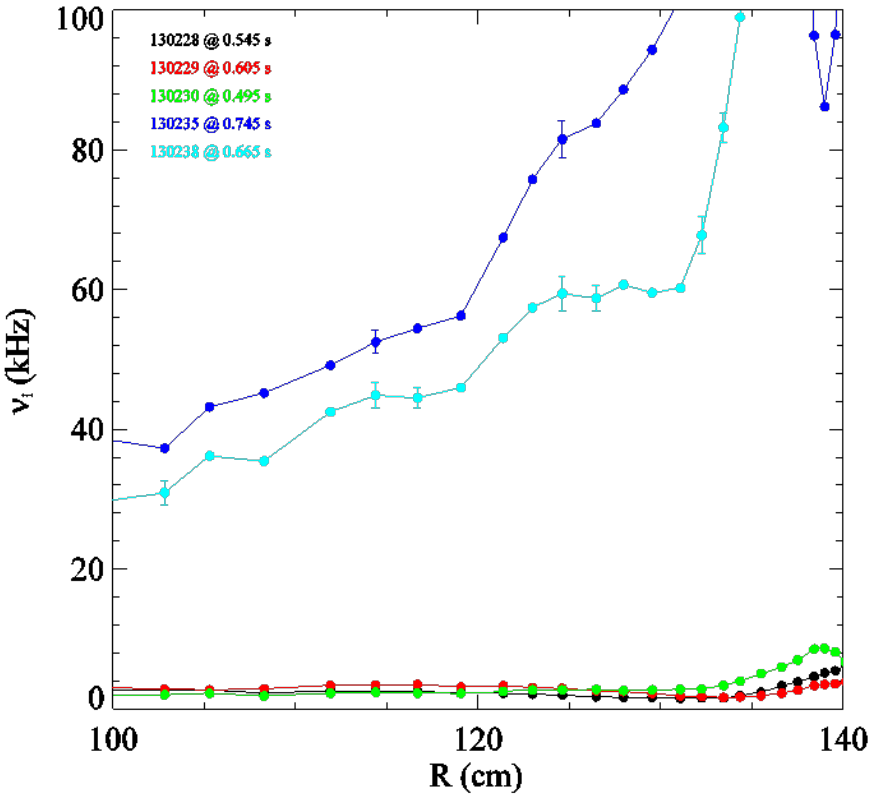
(Reimerdes, et al., PPFC 49 (2007) B349)

Gives a measurement of the growth rate and rotation frequency of a weakly damped, stable RWM.



Collisionality considering Z_{eff}^4 is much different





RWM identification