

Coronal Seismology

ASTR 598

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Overview

The body of the frame

Motivation/Main Scientific Question

- ▶ The coronal heating problem

Basic Wave stuff

Types of waves/oscillations:

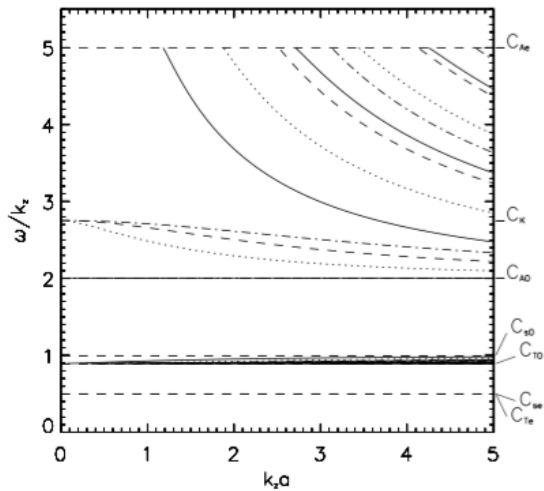
- ▶ Alfvén
- ▶ fast $C_{A_0} < C_{fast} < C_{A_e}$
- ▶ slow (acoustic) $C_{T_0} < C_{slow} < C_{s_0}$

Modes:

- ▶ Kink
- ▶ Sausage
- ▶ Acoustic

Basic MHD equations

Maybe...



Kink and Sausage modes

- ▶ fast magnetoacoustic waves
 - ▶ $m = 1$
 - ▶ low plasma β
 - ▶ present in coronal loops
- ▶ something about sausage modes

Kinks and Sausages

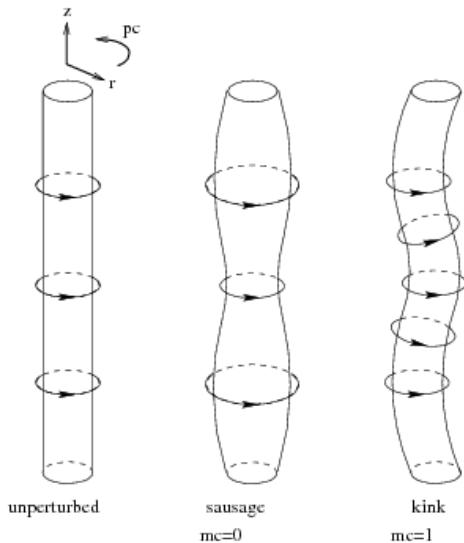


Figure: *

Kink1: Coronal loop oscillations observed with the *Transition Region And Coronal Explorer (TRACE)*

- ▶ Gaussian vs. exponential
- ▶ Plasma motions around footpoints of coronal loops

Kink2: Excitation and damping of broadband kink waves in the solar corona

Sausage1: Observations of sausage modes in magnetic pores

Sausage2: Sausage waves in transversely nonuniform monolithic coronal tubes

Important Properties

	timescale	sizescale	obs. method
kink osc	value	value	value
sausage osc	value	value	value
acoustic osc	value	value	value
acoustic waves	value	value	value
fast waves	value	value	value
torsional modes	value	value	value
mixed modes	value	value	value

Example Table

		Condition (Gold standard)	
		True	False
Test outcome	Positive	True Positive	False Positive
	Negative	False Negative	True Negative

My Research