BO - A powerful fluid and kinetic plasma wave and instability analysis tool

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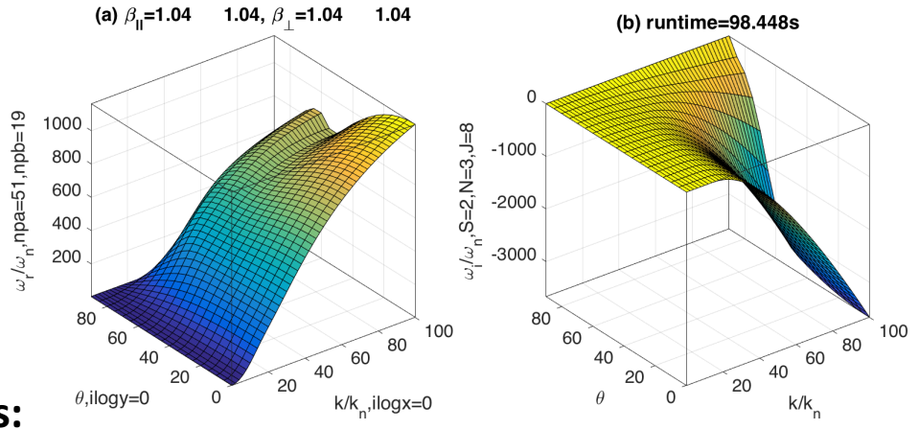
-Introduction

- BO (‘波’ , i.e., ‘wave’ in Chinese) currently includes BO-F (PDRF, multi-fluid solver) and BO-K (PDRK, kinetic solver).
- BO-K (PDRK) solves uniform plasma dispersion relation with an extended Maxwellian based equilibrium distribution function.
- For D(omega, k)=0, give k, solve series omega(s).
- ***What make BO attractive?*** Solves the difficulty of root finding, i.e., the *first solver* not requires initial guess and can *give all the important solutions at one time*. You *do not need luck* any more!
- ***Supports:*** anisotropic temperature / loss cone / *drift in arbitrary direction / ring beam / collision*, unmagnetized / magnetized species, electrostatic/electromagnetic/Darwin, can kpara<=0, etc.

-Typical example

- Fast-magnetosonic/whistler dispersion surface



- Refs:

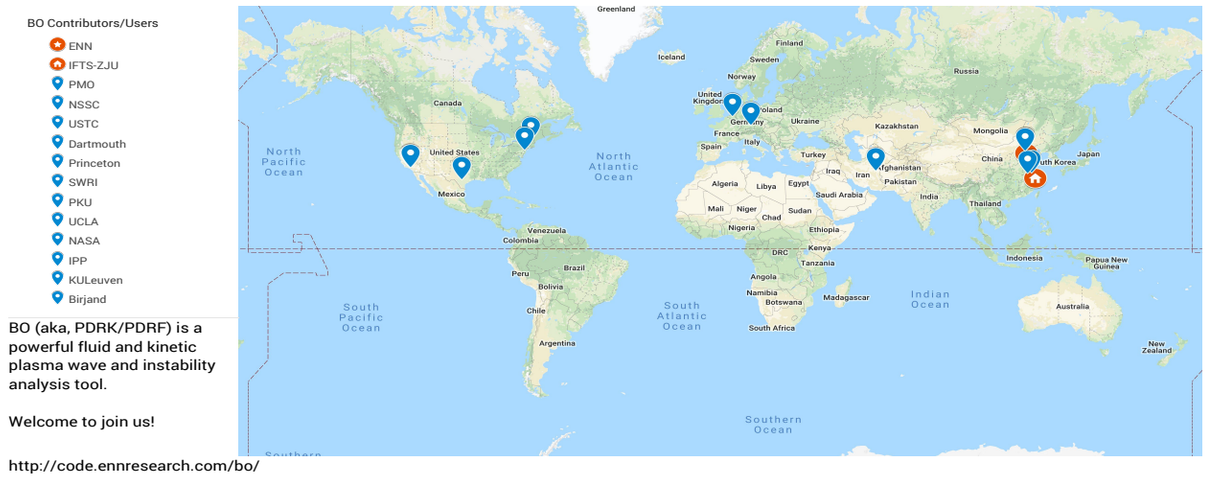
- H. S. Xie & Y. Xiao, Plasma Sci. & Tech., 18, 2, 97 (2016).
- H. S. Xie, BO: A unified tool for plasma waves and instabilities analysis, Comp. Phys. Comm., 244, 343 (2019).
- H. S. Xie, Comp. Phys. Comm., 185, 670 (2014).

-Solvers compare*

	BO (PDRK) [Xie16,19]	WHAMP [Ronnmark82]	KUPDAP [Sugiyama15]	DSHARK [Astfalk15]
Initial guess?	Not required	Must	Must	Must
Fast?	Middle	Fast	Middle	Middle
Support high harmonic?	Easy	Difficult	Difficult	Difficult
Separate modes?	Easy	Difficult	Difficult	Difficult
All solutions?	Yes	No	Multi solutions in given range	No
With perp drift?	Yes	No	No	No
With collision?	Yes	No	No	No
Key feature	All solutions, rich models	Fast, widely used	Multi solutions	Kappa distribution

*Other solvers not shown here, e.g., P. Gary’s, Verscharen’s, …

BO Contributors/Users Map (2018)



-Download:

- http://code.ennresearch.com/bo/ (with latest version)
- https://github.com/hsxie/pdrk (v181027 and older)

Welcome to join us/spread this poster!

- Ackn:

- R. Denton, Xin Tao, Jin-song Zhao, Zhong-wei Yang, Chao-jie Zhang, Can Huang, Wen-ya Li, Liang Wang, Kyungguk Min, Yang Li, Kyunghwan Dokgo, J. L. Burch,…