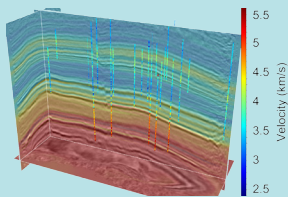
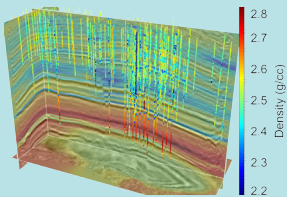


C-Team (Leader: Dave Hale)

Dave Hale works with a group known informally within CWP as the C-Team. One goal shared among C-Team colleagues is good computing. We make good use of increasingly multicore computing systems.



When necessary, we exploit data structures beyond arrays and algorithms beyond array processing to solve a wide variety of problems related to seismic imaging and image processing. We implement our ideas in software that others find useful.



Recent applications include new, improved methods for:

- full-waveform inversion with sparse models
- full-waveform inversion with image-guided gradients
- extracting fault surfaces and estimating fault throws
- unfaulting and unfolding 3D seismic images
- dynamic warping of seismic images
- tensor-guided interpolation and fitting
- image-guided 3D interpolation of borehole data

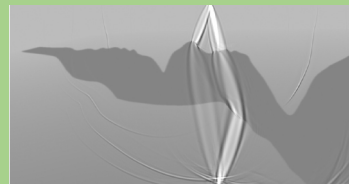
iTeam (Leader: Paul Sava)

The iTeam, or the Seismic Imaging Team, focuses on developing full wave-field methodology for imaging the interior of the Earth.

iTeam projects include:

- isotropic and anisotropic wave-equation migration
- wavefield tomography
- multi-component elastic modelling and migration
- wide-azimuth angle-domain imaging
- micro-earthquake monitoring

The iTeam pursues its goals by blending theoretical analysis, software development and data applications. The team emphasizes simple and efficient methods that take advantage of CWP's growing High Performance Computing capabilities and those methods that can be adopted quickly by Consortium sponsor companies.



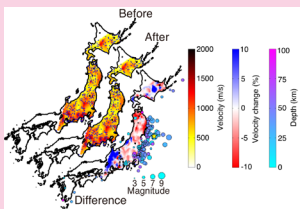
The iTeam promotes open-source software and reproduceable research and is among the top contributors to the **Madagascar** open-source software package.

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STeam (Leader: Roel Snieder)

“Steam” works on seismic interferometry, autofocus, and controlled source electromagnetics (CSEM).

Research on seismic interferometry is aimed at extracting information from noise, optimizing the illumination of the subsurface, and using the quasi-continuous character of measurements inferred from seismic interferometry for time-lapse monitoring. The map of Japan (left) shows the shear velocity in the near surface in the 3 months before and after the Tohoku earthquake, as well as the reduction in shear velocity.



Recent work on autofocus has led to the development of data-driven methods to image with internal multiples. As with seismic interferometry, this work consists of a combination of theory, numerical simulation, and application to data.

The Steam also investigates Controlled Source Electromagnetics (CSEM) by applying the concept of synthetic aperture sources to diffuse fields.

A-Team (Leader: Ilya Tsvankin)

The A(nisotropy)-Team works on inversion and imaging of seismic reflection data from anisotropic media and on fracture characterization. The A-Team collaborates with the Reservoir Characterization Project at CSM on time-lapse monitoring of tight fractured reservoirs.

The A-Team's current projects include:

- joint ray-based tomography of reflection and VSP data for tilted TI media
- correction for velocity lenses and other types of lateral heterogeneity in anisotropic velocity and AVO analysis
- monitoring compacting reservoirs using time-lapse signatures of PP-, PS-, and SS-waves
- development of inversion/processing methods for orthorhombic media
- full-waveform inversion of multicomponent reflection data for anisotropic media
- estimation of P- and S-wave attenuation coefficients for heterogeneous TI media

Many A-Team research results over the past decade are summarized in the new SEG book by I. Tsvankin and V. Grechka, *Seismology of Azimuthally Anisotropic Media and Seismic Fracture Characterization*.

CWP

Center for Wave Phenomena



Mission

- Academically current research relevant to our sponsors
- Excellence in all aspects of research
- Talented students and visitors from around the world
- Diversity in research directions and cultural backgrounds
- Growth, creativity and independence through a nurturing, caring atmosphere

People

Professors: Dave Hale (CWP Director), Roel Snieder, Ilya Tsvankin

Associate Professor: Paul Sava

Research Assistant Professor: Jyoti Behura

CSM Professors Emeriti: Norman Bleistein, Ken Larner

Students and Visitors: Over 30 individuals from 15 countries

CWP Research Associate: John Stockwell

CWP Staff: Shingo Sean Ishida, Pamela Kraus, Diane Witters

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For sponsorship opportunities, contact Dave Hale at dhale@mines.edu



Center for Wave Phenomena

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