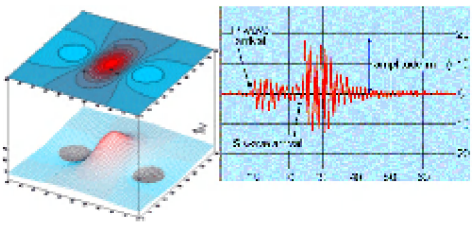
9-2003

GEOL 437.01: Seismology and Magnetics

Steven D. Sheriff
University of Montana - Missoula, steven.sheriff@umontana.edu



Seismology and Magnetics - Geology 437

Professor: Steve Sheriff

Grading: Based on exams, problem sets, project reports, participation (on grading papers)

Fall 2003 - Syllabus, followed by what's going on:

- **9/3**: Intro to course, principles of waves, terminology, and a couple warm-up problems.
- **9/8**: Go over problems, least squares(2) constraints, Huygens principle
- **9/10:** Laws of reflection & refraction, Figures(1, 2), 2-layer refraction equations.
- **9/15:** Problem set #2, multiple layers, applet, dip, velocity problems, qualitative refraction interpretation.
- **9/17**: Haeni/USGS paper (8.5mb) Geometrics applications, should make sense, sampling ideas, automation of interpretation, terminology, arrivals, equipment considerations
- **9/22**: Meet at the play field north of the football stadium (unless it rains) to conduct refraction experiments (Smartseis manual, quick sheet, Geometrics).
- **9/24**: Meet at the play field north of the football stadium (unless it rains) to conduct refraction experiments so you can proceed with the seismic field assignment.
- **9/29:** refraction **problem,** Geomagnetism, declination, inclination, magnetic elements
- **10/1:** Frozen flux theory**,** spherical coordinates, dv, equation for uniformly magnetized sphere
- **10/6:** Uniformly magnetized sphere, Dipole equation, paleolatitude, rotations and translations, spherical trig
- **10/8:** Excel's Solver (help), pole calculations, apparent polar wander, and fluxgate magnetometers.
- **10/13:** Another fluxgate and proton precession magnetometers (1, 2), mag anomalies vs latitude, (1, 2, 3, 4), DNAG mag, US aeromag maps, Magcad (save model(delete crashes)), and sampling theory
- **10/15:** Problems, SIPwin (history -3mb pdf), mag anomalies vs latitude, (3, 4), dipole applet, environmental scale: Philippines figures: 1, 2, 3, total field anomalies and magnetic gradient.
- **10/20:** Aeromag maps, NOAA Geomag site, auroras (Lorentz force), and the GEM magnetometer. The quick sheet presents the basics of operation; the complete document provides more detail.
- **10/22:** Magnetic field assignment, Canadian magnetic applications, java map, Blakely's Puget Sound work, sampling and reconstruction, continuation
- **10/27: Midterm exam**
- **10/29**: Surfer, gridding & presenting x, y, z data with examples: Contouring is Interpretation**!**, Goodnews figures (1, 2, 3) and my report
- **11/3**: Start rock magnetism, hysterisis (from Butler), and Curie temperature
- **11/5**: Magnetic minerals, Download data from the gradiometer

Here's how the course went during fall 2002:

- **9/4**: Intro to course, principles of waves, terminology, and a couple warm-up problems.
- **9/9**: Go over problems, Huygens principle, laws of reflection & refraction, Figures(1, 2).
- **9/11**: Problems(revised numbers - originals work too) for 9/16, 2 & 3 layer refraction equations, ray tracing. Haeni/USGS paper (8.5mb).
- **9/16**: Qualitative refraction interpretation, terminology, equipment considerations, picking arrivals on the EG&G seismograph, setup and operation of the Smartseis.
- **9/18**: Meet at the Riverbowl field (unless it rains) to conduct refraction experiments so you can proceed with the seismic field assignment. Everything worked great except the final printout from the SIPQC software on the Smartseis. My current guess is the program picks a printer scale as a function of the geophone numbers (like ~1,000 from our origin) instead of the distances (ours were ~ 1-10 meters).
- **9/23**: A refraction problem using last week's data and another session in the field with the Smartseis. Everything worked fine, use small numbers for small experiments and the software seems to be happy.