STANFORD UNIVERSITY
SCHOOL OF EARTH SCIENCES
Earth, Energy, Environment

StaRT: Stanford Reactive Transport Summer School

Reactive transport approaches:

from "back of the envelope" to numerical simulation

when are models needed, which one to use and what's taking that computer so long?

June 4th to 6th at Stanford University

co-organized by:

Kate Maher and Jennifer Druhan

This short course, co-sponsored by NSF and Stanford School of Earth Sciences, is free of charge to all graduate students and postdocs. Attendees must cover their own travel and lodging but some meals will be provided.

Followed by a Geochemist's Workbench Short Course June 7-8

(http://www.gwb.com/Goldschmidt2014.php)

(register separately)

NSF

StaRT: Stanford Reactive Transport Summer School

Not all geochemical problems require use of numerical models and not all geochemical problems are suitably parameterized to allow the use of full multi-component reactive transport models without unwarranted assumptions. This course will provide the tools to develop models appropriate to a wide variety of problems in geochemistry and environmental science.

What: A short course on the use of reactive transport approaches to analyze geochemical processes in environmental systems that will provide a foundation of knowledge for future code-specific courses.

Who: This course is geared for graduate students and early career scientists with a background in geochemistry who are interested in incorporating mass transfer concepts into their research and gaining skills in evaluating and developing reactive transport models of various levels of complexity.

Why: Reactive transport methods are becoming an integral component of geochemical research, but are often associated with a steep learning curve. The purpose of this course is to help users navigate this process. The goal is to provide a basic introduction to reactive transport modeling as a platform for more specialized methods. When is a model needed? What type of model should be employed? What is going on 'under the hood' of a numerical model and how do we know the results are useful?

This course will provide an introduction to:

(1) conceptual models of mass transfer, including reactor models, and their application to biogeochemical problems,

(2) transport processes and the fundamentals of discretization for continuum scale problems, and

(3) numerical reactive transport approaches and how they can be used to address biogeochemical problems, including model parameterization, application/philosophy, and construction of simulations.

This course will provide examples of:

reactive transport approaches to quantify biologically mediated reactions, contaminant remediation, weathering and isotope geochemistry

This course will provide the opportunity to:

(1) develop a fundamental understanding of mechanistic models and their application to environmental problems

(2) see what's happening 'under the hood' of numerical reactive transport codes

(3) gain practical experience working with simplified models of flow, transport and chemical reactions

(4) develop a strategy for employing reactive transport methods in current research goals

StaRT: Stanford Reactive Transport Summer School

Schedule

Day 1: Fundamentals of transport and reactions

AM: Introduction to flow and transport: Darcy's law, Advection, Diffusion/Dispersion and Reactor Models (e.g., Batch, Continuously Mixed Flow (CMFR), Plug flow (PFR))

PM: Introduction to and to geochemistry: equilibrium, solubility, activity, kinetics, microbial reactions

PM2: Applications: Modeling U sequestration approaches

Evening: Catered courtyard dinner at Stanford School of Earth Sciences

Day 2: Numerical methods for reactive transport

AM Introduction to numerical methods - geochemistry

Newton's methods, speciation/mass balance

PM: Introduction to numerical methods – transport

discretization, explicit vs. implicit, stability and numerical dispersion

PM2: Applications: Biogeochemical sulfur cycling and isotope fractionation

Evening: free evening for participants to enjoy Palo Alto

Day 3: Putting RTMs to good use

AM: Parameterizing models

Hydrologic parameterization

Geochemical parameterization

PM: Travel to Jasper Ridge Biological Preserve for data acquisition

PM2: Incorporate data into a parameterized model for soil weathering profile

Evening: BBQ at Jasper Ridge

Participant information:

Registration: A website will be available soon for registration. Please email kmaher@stanford.edu in the interim to hold your place.

Travel and Accommodation: Palo Alto is about equidistant from San Francisco Airport (code SFO) and Mineta San Jose International Airport (SJC). Super Shuttle provides reliable, door-to-door transportation from either airport to locations in the Palo Alto area.

A convenient free shuttle connects campus locations to the Palo Alto Caltrain station, as well as to nearby shopping, dining, and lodging. 511.org provides a wealth of information about transit in the Bay Area.

A number of lodging options are located near the Stanford campus. The Schwab Residential Center offers rooms within walking distance of the workshop venue. Stanford maintains a list of motels and hotels arranged by proximity to campus.

Recommended Lodging Options:

1) Cardinal Hotel, 650-323-5101
235 Hamilton Avenue, Palo Alto
www.cardinalhotel.com
Located in downtown Palo Alto, close to restaurants and nightlife. Campus shuttle stops 2-3 blocks from hotel.

2) Stanford Terrace Inn, 650-857-0333
531 Stanford Avenue, Palo Alto
www.stanfordterraceinn.com
Easy access to campus, one block from Marguerite shuttle stop.

3) Stanford Guest House, 650-926-2800
2575 Sand Hill Road, Menlo Park
www.stanford.edu/dept/hds/guesthouse/
Located next to Stanford Linear Accelerator. Shuttles to campus every 40 minutes.