

Brin MRC Summer School: Tracer Mixing in Fluids Across Planetary Scales

1 Basic Information

Date/time: July 8, 2024 - July 19, 2024

Location: *Main sessions* - Brin Mathematics Research Center, located on the 4th floor of the Computer Science Instructional Center (CSIC). See <https://brinmrc.umd.edu/visit/directions.html> for more.

Poster sessions- Department of Mathematics Kirwan Hall Rotunda. We will walk over from the Brin MRC to the poster session.

Online attendance - If any attendees fall ill during the meeting and must quarantine in their hotel room, we will send a private Zoom link to attend remotely.

Contacts:

Tad Komacek (Astronomy), tkomacek@umd.edu.

Ved Lekic (Geology), ved@umd.edu.

Jacob Wenegrat (Atmospheric and Oceanic Sciences), wenegrat@umd.edu.

If you require any accommodations during the school beyond what is listed in this document, please get in touch with the organizers before arrival using the contact information above.

2 Code of conduct

As a group of scientists attending this summer school we share a responsibility to act in a professional manner that is welcoming to all, and free from any form of discrimination, harassment, or retaliation. We expect to jointly create a welcoming environment conducive to learning, where all participants will be treated with respect and consideration. All participants should feel empowered to prevent, report, and or otherwise mitigate any behavior that violates the spirit of the shared goals. If a participant chooses to report they can contact any of the organizers or the Brin Mathematics Research Center administration.

3 Agenda

We will meet each day from 9 am - 6 pm, with two morning talks from 9:30 am - 12:30 pm (with a coffee break in between), a lunch break from 12:30 - 2 pm during which we will eat together at the dining hall, and afternoon talk and research time from 2 pm - 5 pm. Below is the specific program for each day:

Monday, July 8

9 - 9:30 am: Coffee

9:30 - 9:40 am: Conference welcome (Lekic, Wenegrat, Komacek)

9:40 am - 10:55 am: Peter Driscoll (Carnegie EPL), “Convective processes in Earth’s interior”

10:55 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Mingming Li (ASU), “Simulating Earth’s thermochemical evolution with tracers”

12:30 - 2 pm: Lunch break

–shift to Kirwan Hall Rotunda–

2 - 3:15 pm: Student Poster presentations (first half of alphabet)

3:15 - 3:45 pm: Break

3:45 - 5 pm: Student poster presentations (second half of alphabet)

5 - 6 pm: Welcome reception

Tuesday, July 9

9 - 9:30 am: Coffee

9:30 - 10:45 am: Presentations of research project ideas

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Xi Zhang (UCSC), “Tracer transport on exoplanets and brown dwarfs”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Cheng Li (UMichigan), “Distribution of condensable vapors on giant planets”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Finish presenting and brainstorming research project ideas

5 - 6 pm: Discuss with potential research project advisors

Wednesday, July 10

9 - 9:30 am: Coffee

9:30 - 10:45 am: Deep Ray (UMD), “Discontinuous Galerkin (DG) schemes for conservation laws”

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Marianna Linz (Harvard), “Interrelationships between long-lived tracers”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Daniel Leconaet (Northwestern), “Dedalus: Solving PDEs with Global Spectral Methods”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Choose research groups, begin work!

5 - 6 pm: Collaboration and/or free time

Thursday, July 11

9 - 9:30 am: Coffee

9:30 - 10:45 am: Jake Gebbie (WHOI), “Inverting tracers for surface-to-deep ocean circulation pathways and rates”

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Cheng Li (UMichigan), “Chemical tracers in the upper atmosphere of Mars”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Daniel Leconaet (Northwestern), “Tracer Transport in Stars”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Collaboration and/or free time

Friday, July 12

9 - 9:30 am: Coffee

9:30 - 10:45 am: Richard Walker (UMD), “Examining mantle mixing processes with short-lived radionuclide systems”

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Baylor Fox-Kemper (Brown), “Given velocity, tracer transport equations are linear”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Xi Zhang (UCSC), “Transport of chemical tracers on Venus”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Depart via public transit or rideshare for conference dinner at Cielo Rojo in Takoma Park.

6 pm: Conference dinner begins at 6 pm sharp.

Saturday, July 13

All-day outing to Great Falls National Park via shuttle bus for hiking and a picnic lunch. Departing from campus at 9 am, arriving back at campus approximately 3 pm. Everyone is strongly encouraged to attend.

Sunday, July 14

No formal events. Tad will lead an informal trip to the National Mall, departing from the Best Western Hotel at 10:00 am.

Monday, July 15

9 - 9:30 am: Coffee

9:30 - 10:45 am: Wanying Kang (MIT), “Observation technique for icy satellites”

10:55 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Baylor Fox-Kemper (Brown), “Detecting ocean eddy-induced transport”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Deep Ray (UMD), “Shock-capturing in DG schemes”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Collaboration and/or free time

Tuesday, July 16

9 - 9:30 am: Coffee

9:30 - 10:45 am: Mingming Li (ASU), “Multiscale structure and dynamics of Earth’s mantle”

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Jake Gebbie (WHOI), “Recent evidence from ocean tracers for changes in Earth’s climate”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Wanying Kang (MIT), “Ice-ocean interaction in icy ocean worlds”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Collaboration and/or free time

Wednesday, July 17

9 - 9:30 am: Coffee

9:30 - 10:45 am: Extra research time

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Marianna Linz (Harvard), “Using the idealized age tracer to infer circulation”

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Darryn Waugh (JHU), “Mixing and stirring associated with vortices: Atmospheric polar vortices to ocean mesoscale eddies”

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Collaboration and/or free time

Thursday, July 18

9 - 9:30 am: Coffee

9:30 - 10:45 am: Peter Driscoll (EPL), “Searching for the age of Earth’s inner core with numerical dynamos and paleomagnetism”

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Extra research time

12:30 - 2 pm: Lunch break

2 - 3:15 pm: Extra research time

3:15 - 3:45 pm: Break

3:45 - 5 pm: Research time

5 - 6 pm: Collaboration and/or free time

Friday, July 19

9 - 9:30 am: Coffee

9:30 - 10:45 am: Student Presentations 1

10:45 - 11:15 am: Coffee break

11:15 am - 12:30 pm: Student Presentations 2

12:30 - 2 pm: Lunch break

2 pm: Departure

4 Transportation and Parking

We recommend taking public transportation to the meeting (parking on campus is expensive and driving on campus is often not enjoyable). Here are transportation and parking options:

Metro: UMD is served by the College Park Metro stop, which is on the Green line to Greenbelt (it’s the second to last stop). You can then either walk (about 25 minutes) or take the UMD 104 route from the College Park metro stop to campus. UMD’s campus is also served by the Metrobus from New Carrollton if the orange line works better for you.

MARC: UMD is served by the MARC-Camden line that runs from Baltimore (Camden Station) to D.C. (Union Station). The College Park stop is adjacent to the Metro stop. You

can then either walk (about 25 minutes) or take the UMD 104 route from the College Park metro stop to campus.

Visitor parking: For students and speakers staying at a hotel near campus (Best Western, The Cambria, or The Hotel), parking will be available at the hotel. If you are attending locally, visitor parking is available on the roof of Regents Drive Garage or in the Xfinity Center lot, both within a ten minute walk of the meeting venue. The cost is 3 dollars/hour, with a maximum of 15 dollars/day. See <https://transportation.umd.edu/parking/visitors> for more information on visitor parking.

Bike parking: There is ample bike parking on campus near CSIC, and College Park can be navigated largely on bike paths and bike-friendly roads, including the Paint Branch Trail (<https://www.collegeparkmd.gov/trails>).

5 Food!

There are a variety of dining locations on campus, described in detail at <https://dining.umd.edu/hours-locations>. To quickly summarize, the main options are as follows.

Yahentamitsi Dining Hall: We will be eating lunch together here each weekday. This is the newest dining hall at UMD, and has a variety of options covering a range of cuisines and dietary preferences.

Stamp Student Union: The student union (about a 10 minute walk from the meeting venue) has a food court with Saladworks, Panda Express, Qdoba, and a variety of other options. There is also a coffee shop that serves Starbucks.

Physical Sciences Complex: The Quantum Cafe in PSC has coffee, pastries, and to-go sandwiches, and is open in the summer. There's a nice shaded seating area outside below the PSC Ellipse.

Off-campus dining: There are a variety of restaurants on Baltimore Ave. (about a 10-15 minute walk from the meeting and near hotels that students and speakers are staying at). This includes Vigilante Coffee, Sweetgreen, Board and Brew, and Moge Tee (for boba), among many other spots.