

#	Deliverables
1	List of major branching points from a solar system, disk, and planetary interior perspective, and what the impact of those points would be on exoplanet observables. This list will be started on day #1 in a Google Doc and on the blackboard and added to/revise daily during the end-of-day plenary discussion.
2	Outline for paper(s) exploring theoretical implications of early planet formation for volatile incorporation into planets and process observables.
3	Outline for proposals with VLT CRIRES+, JWST, and ALMA to look for signatures of early planet formation in disks and exoplanet atmospheres.

Workshop format: To optimize the interactive portion of the workshop for all of the participants, we will ask the invited, contributed, and flash talk speakers to pre-record their talks and post them two weeks before the workshop. Attendees will have the option of reviewing the talks recordings together from 13:00-14:45. To facilitate discussion on the first day, we posted a Google Doc two weeks before hand with a preliminary set of "branching points" where the path to forming Earth may have diverged. The participants will be able to modify these points to kick start the discussion on the first day. The topics each day are organized such that the breakout sessions each day result in a list of points/processes/changes that will act as input for the discussions on the next day. The final branching point list is our first deliverable, and the next three lists provide input to the sessions on the last day, which will result in two additional end-of-conference deliverables of outlines for papers and proposals.

The afternoon sessions are broken into a period to summarize the pre-recorded talks, introduce participants who are working on that day's subjects, and pose the question of the day to the working groups. This is followed by breakout sessions to address that question, and then a plenary session to refine these responses for the next day's session.

Pre-conference activities:

Initial branching points list: Identification of inflection points in Earth's assembly history where compositional outcomes could have been different. Use Krijt et al. PPVII chapter as starting points.

Recorded talks: Post 1 week in advance, to give everyone time to review them.

1 minute slides: Send to organizers 1 week in advance to compile for day 1.

Monday, November 29th

Earth's formation history, implications for composition branching points.

Invited reviews

- Alycia Weinberger: What does it mean to be habitable?
- Sean Raymond: How and when Earth formed.
- Curtis Williams: Volatile isotope fractionation on Earth

Contributed talks (10 minutes)

Panel moderator: Melissa McClure

Question #1: What are the "branching points" that result in terrestrial planets with different volatile compositions from Earth?

End-of-day deliverable (List #1): Refined list of most important branching points in Solar System, where to explore possibilities for branches in discussion on subsequent days.

Time	Activity
13:00-14:45	Synchronous viewing of recorded videos (optional)
14:45-15:00	Coffee break
15:00-15:15	Online welcome by the Lorentz Center and workshop organizers
15:15-15:45	1 minute introduction slides (x30+, depending on final participants?)
15:45-16:00	Panel discussion of Day 1 talks, Q & A
16:00-16:15	Introduction to "branching points" by discussion leader, from Google Doc, bridging from talks into break out session topic. Plenary discussion of which "final outcomes" for planets are interesting to question of habitability, to direct the branching point discussions in break out rooms.
16:15-16:30	Coffee break
16:30-17:15	Break out rooms to consider the branching points, and which processes/ conditions produced certain branches in the Solar Nebula, and how we think apriori those processes/conditions could vary in protoplanetary disks. Pre-plan group leaders/presenter pairing.
17:15-18:00	Plenary discussion, with group presenters showing results from individual breakout rooms. Outcome is refined list of branching points, important nodes for discussion on Tu/Wed/Th/Friday.

Tuesday, November 30th

Volatile inheritance and conditions in young disks.

Invited reviews

- Maria Drozdovskaya: Chemical evolution of ices between clouds, disks, and comets.
- Merel van't Hoff: Physical conditions in young disks

Contributed talks (10 minutes)

Panel moderator: Mihkel Kama

Question #2: How does inheritance vs reset impact inflection point list from day #1? Which aspects of disk structure/composition are most different in young disks?

End-of-day deliverable (List #2): Which young disk properties (e.g. temp, density, radius, mass) modify the input to disk processes (grain growth, pebble drift)?

Time	Activity
13:00-14:45	TBD: Synchronous viewing of recorded videos (optional)
14:45-15:00	TBD: Coffee break
15:00-15:15	Welcome and recap of Monday's discussion
15:15-15:30	Panel discussion of Day 2 talks, Q & A
15:30-15:45	Introduction of inheritance vs reset by discussion leader, bridging into break out session topic. Plenary discussion of which branching points/final outcomes for planets are linked to the early disk stage, to direct the branching point discussions in break out rooms.
15:45-16:00	Coffee break
16:00-16:45	Break out rooms to consider impact of young disk conditions on the branching points.
16:45-17:30	Plenary discussion on results from individual breakout rooms. List of of potential changes to basic physical properties of disks that are inputs to later disk processes (grain growth, pebble drift), for use on Wed/Th/Friday.

Wednesday, December 1st

Solid processing during young to mature disk transition

Invited reviews

- Richard Booth: Dust processing theory within disks: growth, transport processes.
- Coco Zhang: Mature disk observations to show what processes are on-going.

Contributed talks (10 minutes)

Panel moderator: Sebastiaan Krijt

Question #3: What is the impact on dust chemical processing of the differences between young vs mature disks, per day #2 list?

End-of-day deliverable (List #3): Which disk geometries, ages, and stellar properties give rise to variation in disk composition at a given radius, when combined with radial drift & trapping, etc.

Time	Activity
13:00-14:45	TBD: Synchronous viewing of recorded videos (optional)
14:45-15:00	TBD: Coffee break
15:00-15:15	Welcome and recap of Tuesday's discussion
15:15-15:30	Panel discussion of Day 3 talks, Q & A
15:30-15:45	Introduction to dust dynamics on chemistry as disks age, per day #2 list, by discussion leader(s), bridging into break out session topic. Plenary discussion of which branching points/final outcomes for planets are linked to the mature disk stage, to direct the branching point discussions in break out rooms.
15:45-16:00	Coffee break
16:00-16:45	Break out rooms to consider impact of dust dynamics on the branching points.
16:45-17:30	Plenary discussion on results from individual breakout rooms. List of which disk geometries, ages, and stellar properties give rise to variation in disk composition at a given radius, when combined with radial drift & trapping, to discuss on Th/Friday.

Thursday, December 2nd

Volatile processing during/after planetary assembly

Invited reviews

- Joanna Drazkowska: Planet formation mechanisms
- Oli Shorttle: Differentiation and planetary processing
- Tim Lichtenberg: Growth and evolution of terrestrial planets

Contributed talks (10 minutes)

Panel moderator: Chris Ormel

Question #4: How does early vs late formation change how and when planets acquire specific volatiles at different disk locations? How are exoplanet observables in young and mature systems influenced by their formation timescale?

End-of-day deliverable (List #4): Which additional models and observational data are needed to probe the different processes and outcomes between early and late planet formation and mature exoplanets.

Time	Activity
13:00-14:45	TBD: Synchronous viewing of recorded videos (optional)
14:45-15:00	TBD: Coffee break
15:00-15:15	Welcome and recap of Wednesday's discussion
15:15-15:30	Panel discussion of Day 4 talks, Q & A
15:30-15:45	Introduction to how early vs late formation changes how and when planets acquire specific volatiles at different disk locations, by discussion leader(s), bridging into break out session topic. Plenary discussion of which branching points/final outcomes for planets are linked to the differences in planet formation process itself, to direct the branching point discussions in break out rooms.
15:45-16:00	Coffee break
16:00-16:45	Break out rooms to consider impact of planet formation mechanisms on the branching points.
16:45-17:30	Plenary discussion on results from individual breakout rooms. List of which additional models and observational data are needed to probe the different processes and outcomes between early and late planet formation and mature exoplanets for Friday.

Friday, December 3rd

Future observing and modeling prospects to answer the Day 4 questions.

Invited reviews

- Arthur Bosman: JWST/CRIRES+ for disks
- Ilse Cleeves: ALMA for disks
- Matteo Brogi: Exoplanet atmospheres with CRIRES+/JWST

Contributed talks (10 minutes)

Panel moderator: Johanna Teske

Question #5: Given the list on day #4 of needed observational data, what are the synergies for upcoming programs between observatories and with modelers?

End-of-day deliverable (List #5): Summary of the early formation implications for volatile incorporation (from lists 1-4). Summary of planned observing programs/collaborations.

Time	Activity
13:00-14:45	TBD: Synchronous viewing of recorded videos (optional)
14:45-15:00	TBD: Coffee break
15:00-15:15	Welcome and recap of Thursday's discussion
15:15-15:30	Panel discussion of Day 5 talks, Q & A
15:30-15:45	Introduction to synergies between future observations and modeling, by discussion leader(s), bridging into break out session topic. Plenary discussion of which upcoming observations/models are best-suited to probe different branching points, to direct the discussions in break out rooms.
15:45-16:00	Coffee break
16:00-16:45	Break out rooms to draw up plans for specific observing programs, models, new collaborations, motivated also by the free time discussions during the week.
16:45-17:30	Plenary discussion on results from individual breakout rooms. Summary of the early formation implications for volatile incorporation (from lists 1-4). Summary of planned observing programs/collaborations.
17:30-18:00	Farewell from conference organizers