

DEEP DUST:
Probing Continental Climate of the
Late Paleozoic Icehouse-Greenhouse Transition

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ICDP Workshop
Norman, Oklahoma
March 6-10, 2019

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Workshop Goal: *Describe the compelling scientific questions to be answered through coring Permian continental successions of the Mid-continent US and Western Europe, and develop detailed analytical, drilling, outreach, and funding plans.*

“Between a marvelous deployment of glaciation, a strangely dispersed deposition of salt and gypsum, an extraordinary development of red beds, a decided change in terrestrial vegetation, a great depletion of marine life, a remarkable shifting of geographic outlines, and a pronounced stage of crustal folding, the events of the Permian period constitute a climacteric combination...More than any other period since the Proterozoic, the Permian is the period of problems.”

— T.C. Chamberlin and R. D. Salisbury, Earth History, 1907

March 6— Arrivals

6:30- Icebreaker reception at NCED

Dinner on own in NCED restaurant with meal tickets (ends at 9PM)



March 7— DeepDust: Coring the Continental Permian (Day 1)

Breakfast available 7-8AM in Franklin 210-211 for those staying in NCED.

Today's sessions are at NCED (2801 OK-9, Norman, OK 73071)

8:10 Preliminary remarks, safety, etc.

8:15– 8:25 Welcome by Mike Stice, Dean of OU Mewbourne College of Earth & Energy

8:25– 8:45 The ICDP Program— Uli Harms, ICDP

8:50—9:10 Workshop Goals; Project Overview— Lynn Soreghan, OU

Principal Problems of the Permian

9:15-9:35 Dust and Ice in Permian Equatorial Pangaea— Lynn Soreghan, OU

9:40–10:00 Permian Extremes: Evaporites, Mars-Analog Conditions— Kathy Benison, WVU

10:05-10:25 Modeling Permian Pangaea: Cold, Aridity, and Wind — Nick Heavens, HU

10:25-10:45 Coffee/Tea Break

10:45–11:05 The Permian Carbon Cycle — Ying Cui, MSU

11:10-11:30 The Terrestrial Biosphere and Run-Up to the Great Dying — Cindy Looy, UCB

11:35-11:55 Deep Microbial Biosphere— Natsuko Hamamura, KU & Yuki Morono, JAMSTEC

12:00-1:00 Lunch *(in NCED restaurant with meal tickets)*

1:00-1:20 Regional Geology/Stratigraphy of the Anadarko Basin- Ken Johnson, OGS

1:25-1:45 Regional Geology/Stratigraphy of the Paris Basin — Laurent Beccaletto, BRGM

1:50-2:10 Regional Geology of Western European Permian Basins— Sylvie Bourquin, UR

2:10-2:30 Coffee/Tea Break

2:30-4:00 Science Break-Out Groups

Breakout Group Guidelines:

Attendees will be assigned to a group for the first ~30 min of the time, and then allowed to move to group of choice for the second part of the time. (See group list attached. If you are a local participant and not formally assigned, you may join any group). If you are a Leader or Rapporteur, stay with your group the entire time.

Each group has an assigned Leader (lead, facilitate the discussion, prioritize issues, help present at plenary session), and a Rapporteur (help co-lead, and especially take detailed notes, present key points at plenary session).

Task: Discuss the major scientific questions to be answered with core recovered from the DeepDust project, and articulate how these can be addressed.

Define key time intervals, define important scientific questions, and **hypotheses**. Are there information gaps, e.g.— are there research needs to be considered in advance of proposing a drilling project? Define promising scientific approaches, and logistical concerns of the proposed drilling project.

Group 1: Paleoclimate of the Icehouse Collapse (first half of Permian)

Leader— Majie Fan; Rapporteur— Jay Zambito

Group 2: Paleoclimate of the Run-Up to the Great Dying (second half of Permian)

Leader— Sylvie Bourquin; Rapporteur— Ying Cui

Group 3: Paleoecology

Leader— Francisca Oboh-Ikuenobe; Rapporteur— Cindy Looy

Group 4: The Deep Microbial Biosphere

Leader— Natsuko Hamamura; Rapporteur— Kathy Benison

Group 5: Auxiliary Science: Tectonics, Microseismicity, Geothermal Energy, Planetary Science

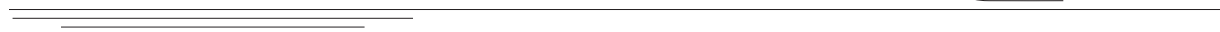
Leader— Nicholas Heavens; Rapporteur— Anders Noren

4:00-5:40 Reports of Working Groups and Plenary Discussion (20 minutes/group)

5:45— Shuttles begin departing for Sam Noble Museum

6:00— Dinner, Sam Noble Museum of Natural History (Museum gift shop will be open)

9:00— Shuttles begin departing from museum to return to NCED



March 8— Field Trip to the Permian of the Anadarko Basin (Day 2)

Breakfast available starting 6AM for those staying in NCED at NCED restaurant with meal tickets

- 7:45— Load onto bus (NCED parking lot). Departing by 8AM.
8:00— Dinner in the Oklahoma City Stockyards at McClintock Saloon & Chop House (<http://mcclintocksaloon.com>). Western-wear/art shops will be open.



March 9—Methodology, Logistics, & Planning Working Groups (Day 3)

Breakfast available starting 6AM for those staying in NCED at NCED restaurant with meal tickets
Today's sessions are at the Devon Building, OU Campus

- 7:30— Shuttles begin departing from NCED to OU Campus (Devon Building)
8:00— Coffee/Tea available
8:30-8:45 Synthesis of Key Science Themes — Lynn Soreghan, OU (Room 120)
9:00-9:30 Drilling operations and fundamental core analysis — Anders Noren, UM
9:30-11:00 Methodological Working Groups [Coffee/Tea Break ~10:00]

Task: What kinds of measurements and/or methods are needed to answer our science questions? Explicitly link each hypothesis/question to one or more specific approaches that can be used to address it. What is the feasibility of these measurements/methods, including level of effort and need for further development? Can precise measurement requirements be identified? How we will be able to date the targeted successions? What proxies/indicators can be applied? How can we derive the most/best science out of the core(s)?

Group 1: Geochronology, Cyclostratigraphy, Magnetostratigraphy, Biostratigraphy...

Leader: Mike Hamilton; Rapporteur— Jahan Ramezani

Group 2: Sedimentology, Paleopedology, Geochemistry, Provenance, Thermochronology...

Leader— Steve Dworkin; Rapporteur— Christian Zeeden

Group 3: Climate- and Carbon-Cycle Modeling

Leader— Georg Feulner; Rapporteur— Nicholas Heavens

Group 4: Geomicrobiology

Leader— Natsuko Hamamura; Rapporteur— Kathy Benison

Group 5: Auxiliary Science (Planetary, Tectonics, Microseismicity, Geothermal Energy)

Leader— Laurent Beccaletto; Rapporteur— Anders Noren

11:00-12:20— Reports of Working Groups and Plenary Discussion

12:20-1:15 Lunch in Devon Hall plaza

1:15-1:30 Building Better Broader Impacts— Amy Myrbo, UM

1:15-3:00 Drilling Planning Working Groups

2:00 Coffee available

Task: What site-survey needs in order to define potential drilling sites, and what are potential sites (locations, depths) based on key science questions? What are potential drilling hazards to consider? What types of on-site data collections are needed? Post-drilling analyses? How should management (of the project and data) be structured? What opportunities exist for education and outreach? What are funding strategies, including partnering with industry?

Group 1: Site surveys, core site(s) selection, hazards (needs, target depths) — Anadarko

Leader— Heather Bedle; Rapporteur—Kathy Benison

Group 2: Site surveys, core site(s) selection, hazards (needs, target depths) — W. Europe

Leader— Stephane Pochat; Rapporteur— Anne-Christine DaSilva

Group 3: Borehole logging, instrumentation; on-site science (what on-site logging is feasible? Is LWD feasible?) Special sampling protocols needed (e.g. microbial)?

Leader— Christian Zeeden; Rapporteur— Linda Hinnov

Group 4: Project and operations management, post-drilling analyses, data management

Leader— Uli Harms; Rapporteur— Natsuko Hamamura

Group 5: Community education and outreach; societal impacts

Leader— Amy Myrbo; Rapporteur— Molly Yunker

Group 6: Funding; industry collaboration

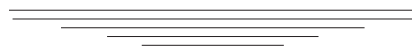
Leader— Suzanne Kairo; Rapporteur— Sylvie Bourquin

3:00-4:45 Reports of Working Groups and Plenary Discussion

4:45— Walk to Bizzell Library (OU Campus)

5:00— Reception & Dinner, History of Science Collection, Bizzell Library (OU)

7:30— Shuttles begin returning participants to NCED



March 10—Wrap Up Day and Way Forward (Day 4)

Breakfast available 7-8AM in workshop room for those staying in NCED.

Today's sessions are at NCED (2801 OK-9, Norman, OK 73071)

8:00— Summary of major objectives, data collection to address science themes
(Link hypotheses to planned data collection)— Lynn

Plenary Discussion

- Science, expertise, technology, site survey needs, permitting, prioritization, outreach

10:00— Coffee/Tea

Funding strategies

- Potential sponsors, programs/solicitations and expected budget limits & deadlines
- Project strategy

Next Steps:

- Workshop report for publication in Scientific Drilling, other outlets

12:00 PM adjourn— Thank you, and have safe travels home!

