



# CARBONATE CRITICAL ZONE RESEARCH COORDINATION NETWORK

## WORKING GROUP DESCRIPTIONS

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### BIOLOGICAL, CHEMICAL, AND PHYSICAL PROCESSES

**Working Group Leader:** [René Price](#), Department of Earth and Environment, Florida International University

**Steering Committee liaison:** *Jon Martin*, Department of Geological Sciences, University of Florida

**Description:** The Biological, Chemical, and Physical Processes group is interested in a variety of processes that cut across disciplines. We will investigate in how water, rock, soil, gases and plants interact to affect weathering processes, groundwater chemistry, groundwater flow, greenhouse gas emissions and ecosystem functioning. Specific topics and questions to be addressed within this broad scope will be determined during the initial meetings.

**Expected outcomes:** Our initial goal is to gather a diverse group of researchers across a variety of disciplines and produce a review paper on the status of knowledge on these topics. The second goal is to identify research gaps and future research directions.

**Working approach:** These activities will be accomplished during approximately monthly meeting that will last 45 to 50 minutes.

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### RATES AND TIME

**Working Group Leader:** [Liz Hasenmueller](#), Department of Earth & Atmospheric Sciences, Saint Louis University

**Steering Committee liaison:** *Laura Toran*, Department of Earth and Environmental Science, Temple University

**Description:** Critical zones are impacted by processes that occur across multiple scales in time that range from short term (e.g., floods, droughts, fires) to long term (e.g., land use, climate, and geomorphic change) events. The response rate of the carbonate critical zone will dictate how its characteristics will be modified by various processes. This working group will focus on timescales in carbonate critical zones, with emphasis on their response rates to perturbations like extreme events, land use alteration, and climate change.

**Expected outcomes:** The goal of the working group will be to develop review papers on topics related to rates and time in carbonate systems. Depending on individuals' interests, the working group might also compile and analyze legacy datasets in research publications or conduct model intercomparison projects.

**Working approach:** To achieve these outcomes, the rates and time working group plans to meet approximately biweekly with participants actively engaging in efforts to address rates and timescales for processes in carbonate critical zones.

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### BOUNDARIES AND SCALES

**Working Group Leader:** [Yongli Gao](#), Department of Geological Sciences, The University San Antonio Texas

**Steering Committee liaison:** *Matt Covington*, Department of Geosciences, University of Arkansas

**Description:** The first key question of this working group is to explore what defines the base of the critical zone in karst systems. The bottom boundary of the critical zone is often planar and subparallel to the surface, although heterogeneity of karst properties leads to non-planar bottom boundaries of carbonate critical zones. Investigations on the types of

bottom boundary conditions of the karst critical zones could result in a review paper based on case studies of different karst systems.

A second question is to investigate what spatial scales (microscopic to landscape) among organismal variations (microbes to trees) impact bedrock geology. An observatory network of subsurface biodiversity and surface landscape in different karst areas is necessary to answer this question.

The third question of this working group is to examine how do physical and chemical weathering interact, particularly as fractures form with depth in the critical zone. A review paper on the modeling of karstification in the critical zone is an important first step to understand karst development from fracture network.

**Expected outcomes:** The goal of this working group will be to develop review papers.

**Working approach:** Working group members are expected to have bi-monthly meetings and a manuscript will be drafted in 12 months. We are committed to fostering diversity, equity, and inclusion (DEI) in the working group. Researchers and students in underrepresented groups are strongly encouraged to join the working group.

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## CARBONATE CRITICAL ZONE AND SOCIETY

**Working Group Leader:** [Rachel Bosch](#), Department of Geology, University of Cincinnati

**Steering Committee liaison:** Ángel A. García, Department of Geology and Environmental Science, James Madison University

**Description:** This group will explore the intersection between human activities and scientific study of critical zone processes, considering societal influences on the critical zone as well as the impact of the wellness of the critical zones on human communities. Motivated to ensure an equitable and inclusive research environment, these are some questions that may be explored within this working group:

- What are potential (and reciprocated) repercussions between human activities and critical zones settings?
- What influences do human activities have on landscape evolution in carbonate terranes?
- To what extent do anthropogenic-induced climate change and land-use changes affect weathering within the carbonate critical zone?
- What are strategies to advance carbonate critical zone science and its communication?
- How do we engage community members and decision makers in carbonate critical zone research?
- How can we engage more diverse identities of critical zone researchers to advance our science and its communication?
- Do differences in critical zone characteristics contribute to inequities such that aspects of social geography reflect the differences in critical zone structure and processes?

Additionally, the CZ & S WG will maintain contact with other working groups in the Carbonate Critical Zone RCN to discuss the intersections of all research areas with societal impacts.

**Expected outputs:** Expected products from this group's activities include a (1) review paper that synthesizes literature on CZ & S to date and (2) identify research gaps and future research directions.

**Working approach:** A suggested working approach are monthly 2-hour meetings. WG participants will be polled to set a meeting schedule that better accommodates the group.

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