学 术 报 告

Deep Time Insight into the Earth System Response to Changing CO_2

报 告 人：Isabel P. Montañez 教授

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主　　办：全国重点实验室、科技处

报告人及报告简介：

Isabel P. Montañez 院士是沉积地球化学和古气候学领域的顶尖学者，于 2021 年当选美国科学院院士。她在全球碳循环扰动和区域气候变化研究方面享有盛誉，尤其专注地质历史时期气候变暖与重大环境演变事件的研究。她的工作极大地推动了人类对地球气候系统长期动态演变及其与重大环境演变关联的认知。Montañez 院士目前担任加州大学戴维斯分校地球与行星科学系杰出教授暨校长领导力特聘教授，以及美国国家科学、工程与医学研究院的地球与生命科学分会主席，国家研究理事会地球科学与资源委员会成员。Montañez 院士已发表学术论文 183 篇，包括 Science（4 篇）、PNAS（5 篇）、Science Advances、Nature Geoscience 等，并出版 14 本学术专著。Montañez 院士同时还是多个国际权威学术组织的会士，包括美国科学促进会（AAAS）、美国地球物理联合会（AGU）、地球化学学会（GS）、欧洲地球化学协会（EAG）、美国地质学会（GSA）以及加州科学院等。她曾荣获多项殊荣，包括美国地质学会 Arthur L. Day 奖章和 Laurence L. Sloss 奖章、欧洲地球科学联盟 Jean-Baptiste Lamarck 奖章，以及美国沉积地质学协会 Francis J. Pettijohn 奖章。

Past periods of Earth history characterized by major changes in paleo-CO2 provide unique insight into how components of the Earth system respond to, interact with, and feed-back on the initial forcing. One such period is Earth's penultimate icehouse, the Late Paleozoic Ice Age (LPIA), ~340 to 390 Ma, a time of expansive and dynamic glaciation, diverse terrestrial and marine life, and paleo-CO2 and global mean-surface temperatures comparable with the range of our recent past and projected future. In this talk, I will present our multi-proxy and multi-dimensional modeling approach to building a 'systems' perspective of this icehouse. I'll illustrate how we have applied this perspective to investigate astronomically paced carbon and climate cycles and to interrogate the drivers, impacts, and responses to major perturbation of these cycles in the terrestrial and marine realms. For the marine realm, I'll focus on how hyperthermal-scale rises in CO_2 impacted ocean circulation and the marine redox landscape, revealing how glaciated times might be more sensitive to rising CO_2 than greenhouse times of overall higher background CO_2. For the terrestrial realm, I'll share how our efforts to model the physiological functioning responses of the extinct plants to changing paleo-CO_2 and O_2 and climate may have led to ecosystem-scale responses capable of strongly influencing global carbon sequestration and surface water cycling during the penultimate icehouse. Despite the very different boundary conditions of the Late Paleozoic, this work contributes to constraining the magnitude and state-dependency of equilibrium climate sensitivity, and to advancing our understanding of global biogeochemical cycles and their response to CO_2-forced perturbation under overall low concentrations.