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## **Epicontinental seas as efficient carbon sinks: proto-Paratethys & West Siberian seas during the PETM**

**Mustafa Kaya**<sup>1</sup>, Guillaume Dupont-Nivet<sup>1,2,3</sup>, Joost Frieling<sup>4</sup>, Chiara Fioroni<sup>5</sup>, Alexander Rohrmann<sup>6</sup>, Sevinç Özkan Altiner<sup>7</sup>, Ezgi Vardar<sup>7</sup>, Birgit Plessen<sup>8</sup>, Mehmet Mamtimin<sup>3</sup>, and Guo Zhaojie<sup>3</sup>

<sup>1</sup>University of Potsdam, Institute of Geosciences, Potsdam, Germany

<sup>2</sup>Géosciences, CNRS Université de Rennes 1, Rennes, France

<sup>3</sup>Key Laboratory of Orogenic Belts and Crustal Evolution, Ministry of Education, Beijing, China

<sup>4</sup>Marine Palynology and Paleoceanography, Department of Earth Sciences, Faculty of Geosciences, Utrecht University, Utrecht, Netherlands

<sup>5</sup>Università degli Studi di Modena e Reggio Emilia, Dipartimento di Scienze Chimiche e Geologiche, Via Campi, Modena, Italy

<sup>6</sup>Institute of Geological Sciences, Freie Universität, Berlin, Germany

<sup>7</sup>Department of Geological Engineering, Middle East Technical University, Ankara, Turkey

<sup>8</sup>GFZ-Potsdam, Section Climate Dynamics and Landscape Evolution, Potsdam, Germany

Removal of carbon on geological timescales is generally assumed to be governed by the relative strength of silicate weathering and organic carbon burial. For past transient warming phases organic carbon burial has been considered as a relevant negative feedback, but it remains uncertain how this compares to present-day anthropogenic emissions. The ocean is very effective at organic carbon remineralization and, only certain regions bury significant amounts of organic carbon. Organic carbon burial hotspots include shallow water regions along active continental margins and permanently oxygen-deficient zones.

Shallow inland seas covering continents bear depositional settings with broad low-energy facies and delivery of low-reactivity, fossil (ancient) and terrestrial (both contemporary and aged, i.e., soil) organic carbon and lithogenic particles when they are associated with an active margin. These epicontinental seas might be hydrographically and geographically restricted resulting in oxygen-depleted environments. As such, epicontinental seas might serve as significant carbon sinks for all types of organic carbon components (i.e. marine, fossil, contemporary and aged terrestrial) with a high organic carbon preservation efficiency. However, oxygen deficient environments associated with epicontinental seas are currently rare and, as a consequence, organic carbon burial may be overestimated in importance as a negative feedback to anthropogenic emissions compared to the past.

As part of the ERC “MAGIC” project, we study the mechanics, relative contribution and preservation efficiency of ancient epicontinental seas as carbon sinks, using organic rich deposits dated to the Paleocene – Eocene Thermal Maximum (PETM) from the proto-Paratethys and West Siberian seas. We then calculate and compare the amount of organic carbon sequestered in these basins, relative to modeled estimates of global organic carbon burial. Our data corroborates the view that

the sequestration of organic carbon arises due to enhanced recycling of phosphorus from sediments under anoxic conditions and coupled increase in biological productivity. We estimate ca. 1380 Gt C burial, plausibly more than half of the estimated global total excess burial across the PETM is focused in the proto-Paratethys and West Siberian seas. This supports the hypothesis that alongside the organic carbon burial on other continental margins, the proto-Paratethys and West Siberian basins acted as significant carbon sinks, leading to the termination of the PETM. An important implication of this is that, for the present-day and other periods in the geological past with small epicontinental seas, the effectiveness of this negative carbon cycle feedback is likely greatly diminished.