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Flat world versus real world : where is weathering the most important ?

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Mountain ranges are a key driver of the Earth climates. Acting on a large range of timescales, they modulate the atmospheric and oceanic circulations but also plays a crucial role in regulating the geological carbon cycle through their impacts on erosion and continental weathering. Since the 90's, there is an ongoing debate about the role of the mountain uplift on the long term global cooling of the Earth climate. Mountain ranges are thought to enhance silicate weathering and the associated CO_2 consumption. But this has been repeatedly questioned in the recent years.

Here we present a new method for modeling the spatial distribution of both physical erosion and coupled chemical weathering. The IPSL ocean-atmosphere model calculates the continental climate, which is used to force the erosion/weathering model. We first compare the global silicate weathering for two geographical configurations: the present-day world with mountain ranges, and a world where all mountains have been removed. Depending on the chosen formalism for silicate weathering and on the climate changes linked to the removal of mountains, it can be higher in the flat world than in the real world, or up to 5 times weaker.

In the second part of the talk, we will explore the role of the Hercynian mountain range on the onset and demise of the late Paleozoic ice age, within the context of the Pangea assembly.