



Climate effects caused by land plant invasion in the Devonian

Le Hir guillaume (1), Donnadieu yannick (2), Godd ris yves (3), Meyer-Berthaud brigitte (4), and Ramstein gilles (2)

(1) Paris VII - Denis Diderot, Institut de Physique du Globe de Paris, France (lehir@ipgp.fr), (2) LSCE, CNRS-CEA-UVSQ, Gif-sur-Yvette, France, (3) G osciences Environnement Toulouse, CNRS-Universit  Paul Sabatier, Toulouse, France, (4) CNRS, UMR AMAP, Montpellier, F-34000, France

Land plants invaded continents during the Mid-Paleozoic. Their spreading and diversification have been compared to the Cambrian explosion in terms of intensity and impact on the diversification of life on Earth. Whereas prior studies were focused on the evolution of the root system and its weathering contribution, here we investigated the biophysical impacts of plant colonization on the surface climate through changes in continental albedo, roughness, thermal properties, and potential evaporation using a 3D-climate model coupled to a global biogeochemical cycles associated to a simple model for vegetation dynamics adapted to Devonian conditions. From the Early to the Late Devonian, we show that continental surface changes induced by land plants and tectonic drift have produced a large CO₂ drawdown without being associated to a global cooling, because the cooling trend is counteracted by a warming trend resulting from the surface albedo reduction. If CO₂ is consensually assumed as the main driver of the Phanerozoic climate, during land-plant invasion, the modifications of soil properties could have played in the opposite direction of the carbon dioxide fall, hence maintaining warm temperatures during part of the Devonian.