



Impact of climate change on global soil distribution within the next century

Antra Boča (1,2), Sophie Cornu (3,1), Claude Manté (4), Bertrand Guenet (5), Joel Guiot (2,1), and Nicolas Saby (6)

(1) Centre de Recherche et d'Enseignement de Géosciences de l'Environnement (CEREGE), Aix-en-Provence, France, (2) Aix-Marseille Université (AMU), Aix-en-Provence, France, (3) Institut National de la Recherche Agronomique (INRA), Aix-en-Provence, France, (4) Institut Méditerranéen d'Océanologie (MIO), Marseille, France, (5) Laboratoire des Sciences du Climat et l'Environnement (LSCE), Gif-sur-Yvette, France, (6) Institut National de la Recherche Agronomique (INRA), Orléans, France

On a global scale climate is the major soil forming factor. Future changes in temperature and precipitation regimes will undoubtedly alter soil forming processes, and, with them, soil properties and the boundaries of soil type occurrence. Using the distribution of soil subgroups from the ISRIC (International Soil Reference and Information Centre) WISE soil property database, and climate data from WorldClim, we investigated the statistical relationships between soil types and climate. In our statistical approach, we combined extreme gradient boosting with rule and instance based regression modelling (cubist). The results showed that about one third of the soil subgroups are strongly linked to climate (soils with gelic properties, various acrisols, ferralsols, podzols, etc.). We used the statistical models to predict potential changes in the distribution of soils with strong climate links using future climate projections for 2061-2080. This approach allows us to quantify the surface area and determine the location impacted by climate change for each soil type, thus providing information on the trajectory of change from one soil to another. Furthermore, an analysis of variable importance from the statistical models provides information on potential causes for a change (e.g., increased drainage due to higher precipitation or higher biological activity due to less severe temperature).