Does geometry matter?

Assessing the influence of plant size and shape on small-scale aeolian flow dynamics.

Department: Physical Geography
Research group: Biomorphodynamics of living river and coastal landscapes
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Project description

Coastal dunes are biogeomorphic landscapes, meaning that they formed through reciprocal interactions between sediment transporting processes and vegetation growth. Along the European coasts, a single species: marram grass (*Ammophila arenaria*) is responsible for building the majority of coastal dunes. Worldwide, *Ammophila* is known as the species that builds the highest dunes due to its ability to trap sand efficiently through its aboveground structure. Both shoot geometry, flexibility and shoot organization impact small-scale (~1 m^{-2}) wind flow, but these effects have never been quantified. As vegetation-sedimentation patterns on coastal dunes emerge through the interaction between individual plant sand-trapping effects it is vital to understand these smallest-scale flow attenuation effects. In this project you will quantify how individual differences in shoot geometry and organization affect wind flow through a combination of field measurements, developing plant 3D geometry models and simulating wind flow using OpenFoam software

Job requirements

We expect you to be enthusiastic about solving this puzzle between object geometry and computational fluid dynamics. We expect you to be curiosity driven and creative in applying and developing new methods. For this project you will both conduct fieldwork, measure plants in greenhouse settings and use existing data to parametrize rules for creating geometry meshes. Next, you will use existing CFD software to assess wind flow patterns on this small plant-scale. Additionally, depending on your interests and ideas there are possibilities to pursue different directions for understanding and parametrizing plant-scale sedimentation effects.