Geophysical Research Abstracts
Vol. 13, EGU2011-3988, 2011
EGU General Assembly 2011

Forest response to recent lava flow disturbances in the central Oregon Cascades, USA

Natalia Deligne (1), Katharine Cashman (2), Daniel Gavin (3), and Joshua Roering (4)

(1) Dept of Geological Sciences, University of Oregon, Eugene OR, United States (ndeligne@uoregon.edu), (2) Dept of Geological Sciences, University of Oregon, Eugene OR, United States (cashman@uoregon.edu), (3) Dept of Geography, University of Oregon, Eugene OR, United States (dgavin@uoregon.edu), (4) Dept of Geological Sciences, University of Oregon, Eugene OR, United States (jroering@uoregon.edu)

Lava flows pave landscapes rapidly, covering underlying ecosystems with dense fractured rock inhospitable to plant establishment and growth. Subsequent plant colonization is dictated by a variety of factors, including seed and nutrient availability, presence of a growth medium on the lava flow, and climate. In this study, we examine reforestation of lava flows at two sites of recent volcanism in the central Oregon Cascades. The Collier Cone lava flow (basaltic andesite to andesite) erupted 1.6 ka and has a maximum length of 14 km. The lava flow crosses several climatic regimes, going from an alpine climate above tree line at its vent (2150 m elevation) to a humid temperate climate at the flow toe (900 m elevation). Our second site is the southern Sand Mountain volcanic field (SMVF) (800 – 1650 m elevation range), consisting of five lava flows (basalt to basaltic andesite) emplaced within $\sim$100 years of one another c. 2.9 ka. Here the vegetation cover is remarkably variable across the volcanic field, with older lava flows hosting mature forests and younger flows having sparse vegetation cover consisting of isolated trees. The Collier Cone lava flow and the SMVF permit, respectively, examination of (1) vegetation response to climate variations along a single lava flow, and (2) revegetation of a succession of lava flows with limited local climate variation. We use 1-m resolution filtered and unfiltered LiDAR data to construct a high resolution canopy map of each site and to quantify and compare canopy characteristics and lava flow morphologies. At both sites, trees are consistently shorter and sparser on the lava flow(s) relative to adjacent areas, irrespective of climate or relative lava flow age. On the Collier Cone lava flow, tree height and density is greatest where sediment has been deposited on the lava flow, suggesting that external soil sources are important for establishing favorable conditions for vegetation growth. This may explain the considerable difference in vegetation cover across the SMVF, as the oldest lava flows likely had more tephra accumulation than younger flows and thus may have had more soil available for vegetation establishment and development. Lava flow morphology may also influence vegetation development at both sites. For example, lava flow levees are more vegetated than associated lava channel interiors, potentially due to differences in average block sizes. Overall, our work suggests that lava flow reforestation is (1) influenced by lava flow morphology and (2) greatly enhanced if there is an external soil source.