Microclimate influences on slope angles in the Western U.S.

M.J. POULOS*, J.L. PIERCE, A.N. FLORES AND S.G. BENNER

Dept. of Geosciences, Boise State Univ., Boise, ID 83725, USA (*correspondence: mikepoulos@u.boisestate.edu)

Hillslopes are considered asymmetric when one side of a hill or drainage is steeper than the other. In the absence of lithologic and structural controls, differences in slope angles may be due to the influence of insolation-induced microclimates on rates and processes of weathering, soil formation, and hillslope erosion. This appears to promote steeper southern aspects in some areas [1], but steeper northern aspects in others [2]. Despite being studied for more than a century [3], we have been unable to explain the processes responsible for microclimate-induced slope asymmetry.

We hypothesize that in the absence of tectonic and lithologic controls, hillslope asymmetry varies spatially due to climatically-driven feedbacks among insolation, evapotranspiration, soil moisture, vegetation, weathering, erosion, and slope stability. To better understand this spatial variability, we systematically map the distribution of asymmetry across the western U.S.. The asymmetry within a given area is quantified by an asymmetry index, which is the log-transformed ratio of average slope angles for northern and southern aspects. Hillslope asymmetry has significant spatial variability throughout the mountain West, but manifests itself within distinct regions with clearly defined transitions.

While a map at this scale is critical for studying the distribution of asymmetry, more information is needed to separate microclimate from tectonic and structural controls. To isolate the influence of microclimate, we select study areas within the tectonically quiescent and mostly homogenous grandiorite Idaho Batholith. Dry Creek watershed, in the southwestern batholith, has northern aspects which are ~8° steeper than southern aspects. The watershed receives ~50-90 cm of annual precipitation, and has ~80% forest cover on northern aspects, but only ~15% forest cover on southern aspects. Alternatively, the Lochsa River watershed in the northern batholith displays no asymmetry, receives ~75-180 cm of precipitation annually, and has nearly homogenous forest cover, despite similar variations in insolation. In the absence of tectonic and lithologic controls, hillslope asymmetry appears to occur in semi-arid areas along ecotonal boundaries, where vegetation is sensitive to microclimate.

[1] Burnett *et al*. (2008) *J. of Geoph. Rsrch*. **113**, F03002. [2] Istanbulluoglu *et al*. (2008) *Geoph. Rsrch. Letters* ***35***, L14403 [3] Gilbert (1904) *J. of Geol*. **12**, 579-588.

Studies of airborne radionuclides in the vicinity of a nuclear facility

L. POURCELOT[1], O. Masson[1], P. RENAUD[1], W. VAN HECKE[2] AND R. GIERE[3]

[1]IRSN Cadarache BP3 13115 Saint-Paul-lez-Durance Cedex, France (laurent.pourcelot@irsn.fr, olivier.masson@irsn.fr, philippe.renaud@irsn.fr)

[2]AREVA NC BP44 26701 Pierrelatte Cedex, France (walter.vanhecke@areva.com)

[3]Institut für Geowissenschaften, Albert-Ludwigs-universität, Albertstrasse 23b, 79104 Freiburg, Germany (giere@uni-freiburg.de)

This study was carried out near a uranium plant in order to evaluate the consequences of actinides releases into the atmosphere. The main activity of the plant is the purification of uranium and the conversion to UF_6, prior to enrichment. Therefore, releases involve mainly uranium and its daughter isotopes. However, in the 1980ies fuel reprocessing has led to spent fuel releases.

Uranium and plutonium isotopes data allow us to distinguish different sources of actinides in the environment of the studied site. Thus soils and sediments accumulate the releases over a long period of time, i. e. mainly the spent fuel and the natural uranium releases. Furthermore, bioindicators (cypress) and crops taken in close vicinity of the plant show that aerosols emitted by artificial ponds constitute an additional source of radioactivity in the environment.

Radioactivity measured in crops allows to evaluate nuclide transfer in annual plants, e.g. in wheat or on leaf surfaces. At the studied site it was observed that the dominant uranium transfer mechanism to crops was deposition of aerosols rather than uptake via the roots.

This work also aims at characterizing airborne particles released into the air to improve the understanding of the release impacts. Thus air sampling is carried out to quantify the activity of uranium in the air at the study site compared to a remote site. Furthermore, the study of cypress leaves by using SEM allows to characterize the airborne radioactive mineral particles.