Masters' Thesis Defense Announcement

An Evaluation of Image Correlation Techniques for Measuring Sand Dune Migration Rates from Remote Sensing Data

Leah Hall
Wednesday, November 28, 2018
2:00 PM – 4:00 PM
Energy Research Park building 4 (ERP4), Room TBA

Committee chair: Dr. Craig L. Glennie, University of Huston, Civil and Environmental Engineering
Committee members:
Dr. Kirsten Siebach, Rice University, Earth, Environmental and Planetary Sciences
Dr. Preston Hartzell, University of Houston, Civil and Environmental Engineering
Dr. Jennifer Telling, University of Houston, Civil and Environmental Engineering

The surface migration rates of sand dunes both on Earth and on other planets provide important information about local and regional wind patterns. However, in situ data is often unavailable and remote sensing data must be applied to understand these environments. This study tested two software techniques, COSI-Corr and PIVLab, and evaluated their performance using high resolution imagery and airborne lidar covering White Sands, NM, Victoria Valley, Antarctica, and Jockey's Ridge, NC. Mean migration rates were calculated from the vector fields produced by each software package and were compared to published migration rates and manual measurements. COSI-Corr produced more thorough vector coverage but underperformed when applied to large spatial and temporal displacements, as well as when there was a high degree of variability in the study area. PIVLab had less complete vector coverage but allowed for the isolation of vectors over the dune features resulting in highly accurate measurements.

Differing image resolutions were also tested to determine how sensitive each technique is to the availability of high resolution data. Image resolutions of 0.25, 0.5, 1, 2, and 5 m were used. In variable environments, PIVLab significantly outperformed COSI-Corr as COSI-Corr velocity results drop by 80% given image resolution lower than 1 meter.