Geophysical Research Abstracts, Vol. 8, 07496, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07496

Anisotropic Scaling of Remotely sensed Drainage basins

A. Beaulieu (1), **H. Gaonac'h** (2) and S. Lovejoy (3)

(1) Centre for Topographic Information, Natural Resources Canada, Sherbrooke, Quebec, Canada, (2) GEOTOP-UQAM-McGill Centre, Université du Québec à Montréal, Québec, Canada, (3) Physics Department and GEOTOP-UQAM-McGil, McGill University, Montreal, Quebec, Canada (gaonach.helene@uqam.ca)

While attempting to quantify geomorphological characteristics of the Earth's surface we have investigated statistical scale invariance of drainage areas from very different geological environments - the Utah Deception Canyon and the China Loess Plateau - using ASTER satellite images. The isotropic energy spectra $E(k)$ of all the albedo fields follow a power law form:

where k is a wavenumber and β is an isotropic scale invariant exponent. We found that the high density drainage area of the China Loess Plateau is the only set of images which exhibits lower βg values (corresponding to rougher surfaces) compared to other images. In spite of the good isotropic scaling it is obvious that the images demonstrating the same β values nevertheless had distinctive textures.

This suggests that the differences are primarily due to anisotropy (which may nevertheless be scaling). We will present a new method the *Weak Differential Anisotropic Scaling* (WDAS) to characterize this scale by scale (differential) anisotropy. It has several advantages with respect to existing ones but works only for systems with weak anisotropy. When applied to drainage basins we found that they have distinct anisotropies characterized by the differential anisotropy stretching and rotation parameters (ζ_1,gθ_1) and the absolute anisotropy (ellipticity) ζg960 m)gt a reference scale of 960 meters. We explain how our new method allows us to statistically distinguish, not only between two geologically different drainage basins (the China Loess Plateau and Utah Deception Canyon), but also between different regions of the same China

drainage system.