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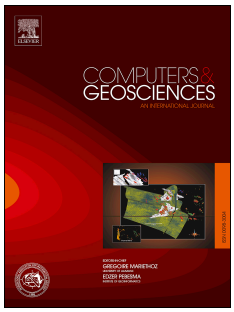


A new approach to the openness index for landform characterisation

F. Alonso-Sarría, F. Gomariz-Castillo, F. Cánovas-García

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ACCEPTED MANUSCRIPT

# A new approach to the Openness index for landform characterisation

F. Alonso-Sarría*[a], F. Gomariz-Castillo[d], F. Cánovas-García[b]

[a] *Instituto del Agua y Medio Ambiente, Universidad de Murcia. Edificio D, Campus de Espinardo, s/n, 30001 Murcia, Spain*
[b] *Unidad Predepartamental de Ingeniera Civil, Universidad Politcnica de Cartagena, Paseo Alfonso XIII, 52. 30203 Cartagena, Spain*
[c] *Instituto Euromediterráneo del Agua, Campus de Espinardo, s/n, 30001 Murcia, Spain*
[d] *Instituto del Agua y Medio Ambiente, Universidad de Murcia. Edificio D, Campus de Espinardo, s/n, 30001 Murcia, Spain*

**Abstract**

Openness is a multi-scale geomorphometric feature that has not been widely used despite its potential. The original approach, which averages zenith and nadir angles in the eight main compass directions, is modified to take into account openness in all available directions; in addition, openness is calculated in different directions and different scales. A statistical analysis and Random Forest classification are carried out to check whether the modifications introduced provide significantly different results from those of the original approach. In addition, it was tested whether multi-scale and multi-direction openness provide relevant and complementary information to total openness. The results show that the original algorithm produces biased, systematically higher, openness estimations. In addition, multi-scale and multi-direction openness produce more accurate Random Forest classifications. Accuracy increases from 0.62 when using total openness to 0.66 when using the multi-scale approach, 0.73 when using the multi-direction approach and 0.75 when both are used.

*Keywords:* Geomorphometric Features, Openness, ANOVA, GRASS GIS

Declarations of interest: None

F. Alonso-Sarría programmed the module, prepared the training points and contributed to write the manuscript. F. Gomariz-Castillo organized the spatial information and contributed to write the manuscript. F. Cánovas-

*Corresponding author. E-mail address: alonsarp@um.es (F. Alonso-Sarría)

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