Title: Parameter analysis that optimizes lossy compression of a multispectral and multitemporal Landsat image series.

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Abstract:

The present work belongs to the group of methodologies that facilitate the access to large spatial datasets in environments with limited storage and the efficient management of such information. In fact, the paper inspects which of the various possible strategies are considered optimal for a lossy compression of remote sensing time series images, specifically Landsat-5 TM images.
A wide range of tests has been carried out to analyze the impact on the compression fidelity depending on spectral or temporal aggregation. Considering this main segregation, other auxiliary parameters have been considered in order to improve outcomes such as: thermal versus optical bands, regions with and without nodata values (nodata is usually strong out of the values range and this particularity influences the quality compression) and clean cloud zones with respect to a significant cloud cover. Tests have been made with different compression ratios (2.5:1, 5:1, 10:1, 20:1 and 100:1) and in geographical areas dominated by different types of landscapes: urban, irrigated crops and deciduous forests, all of them located on Catalonia, a south-western Europe region partially covered by the path-row (197-31) of -Landsat-5 TM .
The authors use the BOI software, implementation of the JPEG200 (Part1) standard for obtaining images with lossy compression and for evaluating quality compression parameters, mainly PSNR (Peak signal to noise ratio) developed by the Group on Interactive Coding of Images (GICI) at the Autonomous University of Barcelona.
Studies show that compression in multispectral segregated groups: thermal/optical, nodata and level of cloud cover, significantly improve compression fidelity in all compression ratios (eg. thermal/optic separation gets 2 dB PSNR additional units in a 5:1 compression). However, the compression of multitemporal series presents the most irregular results; showing sensitive improvements (less than one PSNR units) in most scenes, but some peculiarities at high compression rates. Multitemporal compression analysis of Landsat images (16 days time resolution) is more complex than spectral behavior; it must be studied separately on type of landscape and specific spectral band.
The present work concludes that, mainly, the spectral clustered compression (segregated by the parameters) obtains higher fidelity (2 to 3 dB PSNR units) than time-aggregated compression.
The full paper details the methodology of the selected tests, displays the results analyzed in detail for each of the involved parameters and clarifies specific aspects of all the summarized results presented in this abstract.