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Utilizing hyperspectral imagery for burnt area mapping in a Greek setting

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Earth observation (EO) - particularly so from hyperspectral imagers - gains increasing interest in wildfire mapping as it offers a prompt with high accuracy and low-cost delineation of a burnt area. A key hyperspectral orbital sensor with over 20 years of operational life is Compact High-Resolution Imaging Spectrometer (CHRIS), onboard ESA's PROBA platform. This mission sensor collects spectral data in the VNIR range (400 - 1050 nm) simultaneously at 5 viewing angles and at different spatial resolutions of 17 m and 34 m which contains 19 and 63 spectral bands respectively. The present study focuses on exploring the use of CHRIS PROBA legacy data combined with machine learning (ML) algorithms in obtaining a burnt area cartography. In this context, a further objective of the study has been to examine the contribution of the multi-angle sensor capabilities to enhance the burn scar detection. As a case study was selected a wildfire occurred during the summer of 2007 in the island of Evvoia, in central Greece for which imagery from the CHRIS PROBA archive shortly after the fire outbreak was available. For the accuracy assessment of the derived burnt area estimate the error matrix statistics were calculated in ENVI. Burnt area estimates from were also further validated against the operational product developed in the framework of ESA's Global Monitoring for Environmental Security/Service Element. This study's results evidenced the added value of satellite hyperspectral imagery combined with ML classifiers as a cost-effective and robust approach to evaluate a burnt area extent, particularly so of the multi-angle capability in this case. All in all, the study findings can also provide important insights towards the exploitation of hyperspectral imagery acquired from current missions (e.g. HySIS, PRISMA, CHRIS, DESIS) as well as upcoming ones (e.g. EnMAP, Shalom, HySpiri and Chime).

KEYWORDS: *CHRIS-PROBA, hyperspectral, machine learning, burnt area mapping*