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HIGH-RESOLUTION SUPER-MULTITEMPORAL MONITORING: TWO-DAY TIME SERIES FOR
PRECISION AGRICULTURE APPLICATIONS

Abstract

With increasing population pressure throughout the world and the need for increased agricultural production, there is a definite need for improved management of the world's agricultural resources. Water management systems used in crop irrigation can greatly benefit from high-quality and high-frequency geo-information with reliable and timely delivery, which could lead to both large water savings and better yields. Sentinel-2, with its 5-day global revisit, will deliver high-frequency, high-resolution time series that will greatly benefit agriculture worldwide. Still, some applications like irrigation management would benefit from an even higher observation frequency, both to increase the precision of the control loop, and thus its savings, and to mitigate the effects of clouds avoiding unwanted data gaps. The Deimos-1 satellite, owned and operated by Elecnor Deimos Imaging (Spain), was launched in 2009 and provides 22m, 3-band imagery with a very wide (650-km) swath. It has been specifically designed to assure very-high-frequency revisit on large areas (every 3 days on average for any mid-latitude region), with precision agriculture applications in mind. In cooperation with its twin satellite, DMCii's UK-DMC2, Elecnor Deimos has carried out a monitoring campaign over North Texas (USA), aiming to achieve the maximum possible revisit frequency over a region with a high density of corn and soya crop plots. The purpose of this campaign was the acquisition and fast delivery of orthorectified imagery, to be used as an input for the control and monitoring of irrigation practices in the study area, determining irrigation recommendations. The campaign was conducted from June to September 2013; 72 images of both satellites were captured (one every 1.7 days on average), being 63 of them valid for the study. All products were delivered, ortho, within 24 hours from acquisition, thus feeding an early warning irrigation control system. The combination of such very-high-frequency revisit with the fast delivery of products, which we have called super-multitemporal monitoring, was the key to optimising irrigation recommendations, which led to improved crop productivity, reduced the irrigation costs, and helped achieving a more appropriate and sustainable water management. The 2-day-revisit monitoring with Deimos-1 and UK-DMC2 is a unique service, which is already operational and which can be used worldwide. This paper describes the 2-day-revisit monitoring campaign in North Texas, detailing its main results and achievements, and the super-multitemporal monitoring service and its main products.