

Cloud impact on Landsat surface observations: An assessment based on a decade of daily Terra MODIS observations

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Remotely sensed land observations using passive optical imagers are most useful when they are clear of cloud and cloud shadow contamination. In this study cloud-free Landsat images are defined as those having <10% cloud contamination. This can be achieved by the acquisition of cloud-free images, or the use of cloud-clearing procedures such as pixel compositing and/or merging cloud-free subsets from multiple images.

A detailed assessment of mid-morning cloud cover conditions was performed for the region extending from the Atlantic coast westward to the Indiana/Illinois border over a 10-year period (2003 – 2012) using MODIS daily data sets at 1 km spatial resolution. Since the Terra observatory flies in formation with Landsat 7, MODIS' coarser spatial resolution observations are nearly equivalent to what Landsat would acquire with daily imaging. Our analyses were focused on three Landsat WRS-2 (185X170 km) scene equivalents in Maryland (coastal), Pennsylvania (mountains), and Indiana (interior agricultural belt).

We explored what satellite overpass frequency would achieve cloud-free Landsat observations at weekly, bi-weekly, monthly, seasonally and annual time steps. Our results demonstrate that daily imaging is required to create a weekly clear view, 2-day repeat is needed for bi-weekly cloud-free results, 4-day repeat yields monthly cloud-free observations, 8-day repeat acquires seasonal cloud-free observations, and 16-day repeat can only reliability produce an annual clear view.

Current discussions related to the continuation of Landsat observations is focused on continuing the 16-day or 8-day repeat cycles of previous Landsat missions, but temporal observations at that frequency are unlikely to achieve critical Landsat user community objectives in monitoring various aspects of the terrestrial biosphere. Continuation of the historical, costly "one-at-a-time" approach to Landsat continuity will never achieve these goals. As a community, we need to push for a major shift in Landsat mission implementation that supports substantially higher temporal repeat cycles.

Type of Presentation: oral presentation is desired

Topic or category from web site list: the nature of this subject matter is applicable to multiple categories – put us where you think we best "fit"

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