

Detection rate of the MODIS active fire products

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Abstract

Little research has been done to compare fire activity observed by MODIS satellites to actual on-the-ground fire events in the United States. This is unfortunate because fire data collected by MODIS satellites are an information source with unprecedented spatial and temporal detail. However, uncertainties in MODIS fire detection rates can render the results of analyses using MODIS data difficult to interpret. Our goal was to evaluate how well MODIS detected fires. In particular, we were interested in how the size of a fire affected the probability of MODIS detection. We used 84 reference perimeters of fires 18 or more hectares in size validated using pre- and post-fire Landsat imagery and an additional 89 point location of fires ranging between 0.04 and 1618 hectares in size and validated by National Park Service Personnel. We compared these reference fires to MODIS Terra and Aqua daily active fire detections (mod14a1 and myd14a1 products). Reference fires were considered detected if at least one MODIS active fire pixel occurred within 1-km of a reference fire. Overall, 44% of all fires were detected by aqua and 39% by terra. All fires larger than 2000-ha were detected by both MODIS satellites, and for fires smaller than 2000-ha, detection rates decreased nonlinearly with fire size. According to our logistic regression model, the 50% detection threshold occurred at 50-ha for aqua and 130-ha for terra. Although many factors influence the likelihood that MODIS satellite will detect a fire, such as cloud cover, (etc), fire size explains a significant proportion of the detection variability. These detection uncertainties should be quantified and incorporated into the results of research using MODIS fire data.

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