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Parallax correction methods and objective detection of overshooting cloud tops surrounding extreme weather events location In Indonesia

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The need for satellite-derived products to monitor convective clouds that trigger extreme weather in tropical areas such as Indonesia is very high. The presence of an overshooting top (OT) in convective clouds is often associated with the presence of extreme weather at that location. However, the presence of OT detected by satellite is still in an inappropriate location. This is a natural consequence of the parallax error generated by the Himawari 8 Satellite, which orbits at 140.7E above the equator with an altitude of 35,793 km. In this work, we aim to objectively detect the presence of OT in locations of extreme weather events using Himawaari-8 images. We tested 3 methods for correcting satellite parallax errors with respect to the actual OT position. The first method is to find the height of the cloud top with a cloud-top temperature proxy based on the air lapse rate with a fixed surface temperature value. The second method is similar to the first method, but the surface temperature value used is the dynamic value of the hourly ERA5 surface temperature according to the closest time to the time of extreme weather events. The third method is to use the cloud top height of the HCAI cloud top height product from Japan Meteorological Agency. We evaluated these 3 methods with a case study of extreme weather in Java Island. The result shows that the image's product with this OT feature without parallax correction is able to detect the presence of OT around extreme weather locations with a distance difference of about 13 km. All of these parallax correction methods are able to correct the OT position so that the distance between the OT location and extreme weather locations becomes only less than 3 km. The parallax correction method uses a fixed surface temperature value in the first method and the dynamic value of the hourly ERA5 surface temperature in the second method show almost similar location. Both show the location of the presence of OT which is closer to the location of extreme weather events with a distance only less than 1 km from extreme weather location. However, the first method provides simplicity in computing with result that is almost similar to the second method. Further development and validation of this product at BMKG are expected to help weather forecasters in tropical Indonesia monitor the development of convective clouds that induce extreme weather.