Enhancement of the EUMETSAT Active Fire Monitoring (FIR) Product Over Turkey by Using Regionalized Thresholds

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Wildfires are among the most harmful disasters that Mediterranean countries suffer. Each year, not only remarkable amount of property and settlements are destroyed but also lives of the inhabitants are threatened. Possible effect of wildfires on the climate change due to the direct or indirect aerosol emission is another reason to pay specific attention. For these reasons, intense and comprehensive studies about prediction of the fire prone areas and/or monitoring active fire locations are being conducted. Among these studies, satellite use became a dominant source in detecting and monitoring active fires for the last two decades. During this period, various algorithms are proposed in fire detection by using polar orbiting (e.g., Kaufman et al., 1998; Pu et al., 2007), geostationary satellites data(e.g., Prins and Menzel, 1992; Roberts and Wooster , 2008) or combining both (e.g., Calle et al., 2005).

Along with the other products, Meteorological Operations Division in EUMETSAT is providing the fire product (FIR) via EUMETCast in 15 minute cycle with the full disc coverage. The FIR algorithm considers the brightness temperatures (BT) of the IR3.9μm and IR10.8μm data obtained from SEVIRI instrument. The predefined 5 tests in the algorithm uses the BT of IR3.9μm, BT difference of IR3.9μm and IR10.8μm besides the standard deviations of IR3.9μm, IR10.8μm and difference of IR3.9μm and IR10.8μm. Depending on the preset thresholds, each pixel is classified as either 'possible', 'probable', or 'no fire'.

Tekeli et. al (2009) indicated 15.6% match between the ground fire records and FIR product over Turkey during the 2006 summer. They concluded that using regionalized thresholds rather than using same thresholds for the whole full disc would increase the success of the FIR product.

In this study, possible enhancement, which can be obtained by using regionalized thresholds, of FIR product over Turkey is investigated. The May-August period, indicating increased wildfire activities, for 2007 and 2008 is considered. In the first step, the FIR product success in detecting the active fires is determined by using ground truth over the study area. Secondly, the optimized FIR algorithm thresholds that provide the highest match between the FIR product and the ground truth, for the 5 tests are determined. Then, a new version of the FIR product is generated for Turkey domain utilizing the newly determined thresholds. Finally, the success of the new FIR product is validated and the possible enhancement by using regionalized thresholds in FIR product is discussed.

Keywords: Turkey, Wildfires; Eumetsat: FIR product

References

Calle,A., Casanova, J.L., Moclan,C., Romo,A.J., Cisbani, E., Costantini, M., Zavagli, M., & Greco, B. (2005). Latest algorithms and scientific developments for forest fire detection and monitoring usingMSG/SEVIRI andMODIS sensors.Proceedings of 2nd International Conference on Recent Advances in Space Technologies, Istanbul, Turkey, 9–11 June, 2005 (pp. 118−123).

Kaufman, Y. J., Justice, C. O., Flynn, L. P., Kendall, J. D., Prins, E. M., Giglio, L., Ward, D.E., Menzel, W. P., & Setzer, A. W. (1998). Potential global fire monitoring from EOS-MODIS. Journal of Geophysical Research, 103, 32215−32238.

Prins, E. M., & Menzel,W. P. (1992). Geostationary satellite estimation of biomass burning in South America. International Journal of Remote Sensing, 13, 2783−2799.

Roberts, G.,Wooster, M. J., Perry, G. L.W., Drake, N., Rebelo, L. -M., & Dipotso, F. (2005). Retrieval of biomass combustion rates and totals from fire radiative power observations: Application to southern Africa using geostationary SEVIRI Imagery. Journal of Geophysical Research, 110, D21111. doi:10.1029/2005JD006018.

Pu, R., Li, Z., Gong, P., Csiszar, I., Fraser, R., Hao,W. -M., Kondragunta, S., &Weng, F. (2007). Development and analysis of a 12-year daily 1-km forest fire dataset across North America from NOAA/AVHRR data. Remote Sensing of Environment, 108, 198−208.

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