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Flood monitoring using passive microwave remote sensing in the Senegal River, Western Mali

Soufiane el Khinifri[1], Marc van den Homberg[2], Tessa Kramer[3], Joost Beckers[4], Jaap Schellekens[5], Albert Kettner[6], Abdoul Aziz Mounkaila Issaka[7], Issoufou Maigary[8], Mamadou Adama Sarr[9], and Johannes Reiche[10]

[1]Laboratory of Geo-information Science and Remote Sensing, Wageningen University & Research, Wageningen, Netherlands (s.khinifri@gmail.com)
[2]510 An Initiative of the Netherlands Red Cross, The Hague, Netherlands (mvandenhomberg@redcross.nl)
[3]VanderSat, Haarlem, Netherlands (tkramer@vandersat.com)
[4]VanderSat, Haarlem, Netherlands (jbeckers@vandersat.com)
[5]VanderSat, Haarlem, Netherlands (jschellekens@vandersat.com)
[6]Dartmouth Flood Observatory, University of Colorado - Boulder, Boulder, United States of America (albert.kettner@gmail.com)
[7]510 An Initiative of the Netherlands Red Cross, Kayes, Mali (amounkaila@redcross.nl)
[8]Centre Régional AGRHYMET, Niamey, Niger (issoufou.maigary@cilss.net)
[9]Centre de Suivi Ecologique, Dakar, Senegal (sarr.adama.mamadou@gmail.com)
[10]Laboratory of Geo-information Science and Remote Sensing, Wageningen University & Research, Wageningen, Netherlands (johannes.reiche@wur.nl)

Water supports life, however it does come with hazards. Floods area amongst the most impactful environmental disasters. Accurate flood forecasting and early warning are critical for disaster risk management. Detecting and forecasting floods at an early stage is certainly relevant for Mali, hence crucial in order to prevent a hazard from turning into a disaster. Remotely sensed river monitoring can be an effective, systematic and time-efficient technique to detect and forecast extreme floods. Conventional flood forecasting systems require extensive data inputs and software to model floods. Moreover, most models rely on discharge data, which is not always available and is less accurate in a overbank flow situations. There is a need for an alternative method which detects riverine inundation, while making use of the available state-of-the-art.

This research investigates the use of passive microwave remote sensing with different spatial resolutions for the detection and forecasting of flooding. Brightness temperatures from two different downscaled spatial resolutions (1 x 1 km and 10 x 10 km) are extracted from passive microwave remote sensing sensors and are converted into discharge estimators: a dry CM ratio and a wet CMc ratio. Surface water has a low emission, thus let the CM ratio increase as the surface water percentage in the pixel increases. Sharp increases are observed for over-bank flow conditions.
Overall, we compared the passive microwave remote sensing model results of the different spatial

resolutions to the results of a conventional global runoff model GloFAS. The passive microwave remote sensing model does not require extensive input data when used as an Early Warning System (EWS), as many smaller-scale EWS do, we suggest that when improved, the passive microwave remote sensing method is implemented as part of an integrative EWS solution, including a passive microwave remote sensing model and various other models. This would allow for early warnings in data-scarce regions and at a variety of lead times. In order for this to be effective, we suggest that more research be done on correctly setting the trigger threshold, and into the potential spatial interpretation of CMc.