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# ABSTRACT BOOK 2019

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## Forecasting locust risks

# SOIL MOISTURE ESTIMATES FROM SATELLITE IMAGERY TO IMPROVE DESERT LOCUST FORECASTS

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Desert locust is still a major threat to agriculture in an extensive area from Western Africa to India. The preventive management of Desert locust relies on surveying its potential habitats to find outbreaks as early as possible and control the gregarizing populations. Despite being a major ecological driver of Desert locust populations, soil moisture is missing in the current imagery toolkit for preventive management. The SMELLS project funded by the European Space Agency proposed to develop a product of 1km resolution estimates of soil moisture in 4 countries of Western and Northern Africa to test the potential help of soil moisture in Desert locust preventive management.

We used statistical analyses coupling locust presence/absence observations from field surveys with the soil moisture product to evaluate how soil moisture dynamics may influence the development of locust populations. Further analyses aimed in comparing the potential help of soil moisture in preventive management compared to vegetation index, rainfall estimates and soil temperature. Finally, a forecasting model was established with a random-forest approach using both vegetation index and soil moisture.

We observed that a soil moisture dynamics of increase above 9% for 20 days followed by a decrease of soil moisture may increase the chance to observe locusts 70 days later. The gain in early warning timing compared to using imagery from vegetation was estimated to be three weeks. We demonstrated that the errors of the forecasting model may be reduced by the combination of structural and dynamical indicators of soil moisture and vegetation index. However, the forecasts of locust presence were not perfect and there were plenty of room for improvements.

Nevertheless, we recommend the use of maps of soil moisture estimates in the planning of survey campaign of Desert locust as the gain in timing is substantial compared to vegetation index products.

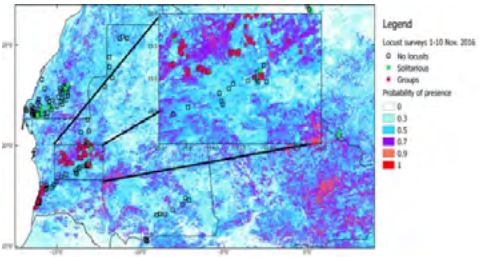


**Figure 1.** Example of forecasting map of locust presence based on soil moisture over 3 months before November 2016 with observations of locusts during the first decade of that month.

***Key Words:*** *Schistocerca gregaria*, satellite imagery, SMOS mission, preventive management, NDVI