The development of a near real-time environmental warning system towards increasing climate resilience and adaptive capacity for rural communities in South Africa

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Abstract

During the past decade, increasing concerns about the impacts of climate change has emerged, which stipulate an increased risk of climate-driven events. A country such as South Africa is particularly vulnerable to climate change impacts because of its dependence on climate-sensitive economic sectors, extreme weather conditions coupled with climate variability and the prevailing high levels of poverty. Therefore, it is imperative for developing countries like South Africa to prepare by monitoring and predicting the changing conditions through the development of early warning systems.

Technological advancements can play a key role in reducing the vulnerability of communities and small-scale farmers to the impacts of climate change and improve the access to climate information for all. The objective of this ongoing work is to integrate, develop and execute an interface that will seamlessly provide rural communities with climate information that can be used for teaching, learning, farming, improving food security and for early warning or risk disaster management. Hence, an environmental early warning system has been set-up in a rural community, which lies within one of the three climate change hotspots in South Africa. The system comprises of an early warning lightning detection system and an automatic weather station. Near real-time results or historic conditions is accessible using a web browser as well as the system notifies using audible and visible alarms, and automates written notifications (via email and short-message-service [SMS]) at nominated 'action/threat levels'.

In this way, a robust and reliable warning system disseminates information to the community, farmers, officials and disaster management agencies that require immediate knowledge of adverse conditions. The warning system operates automatically removing the human element from the system hence minimises the potential for error. A year of data (February 2018-February 2019) was utilized to assess the early warning systems performance. Diurnal variations in lightning activity indicate the influence of solar radiation with peaks occurring during the late afternoon and early evening. Analysis of the alarm state activation indicates majority of escalations were due to the atmospheric electric field changes. In addition to detecting the threat of lightning, the early warning system is beneficial in identifying thunderstorm activity. Finally, the system was found to disseminate warnings timeously, however poor network signals in rural communities are a challenge to such systems.

The work in this study has been adopted as a pilot project for the National Framework for Climate Services for South Africa (NFCS-SA).

Attachments

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Topic Areas

Applications of Lightning Data: Community events, Advanced Warnings

Submission Format

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