Geophysical Research Abstracts
Vol. 14, EGU2012-8515, 2012
EGU General Assembly 2012

Protection of agriculture against drought in Slovenia based on vulnerability and risk assessment

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Past and recent extreme events, like earthquakes, extreme droughts, heat waves, flash floods and volcanic eruptions continuously remind us that natural hazards are an integral component of the global environment. Despite rapid improvement of detection techniques many of these events evade long-term or even mid-term prediction and can thus have disastrous impacts on affected communities and environment. Effective mitigation and preparedness strategies will be possible to develop only after gaining the understanding on how and where such hazards may occur, what causes them, what circumstances increase their severity, and what their impacts may be and their study has the recent years emerged as under the common title of natural hazard management. The first step in natural risk management is risk identification, which includes hazard analysis and monitoring, vulnerability analysis and determination of the risk level.

The presented research focuses on drought, which is at the present already the most widespread as well as still unpredictable natural hazard. Its primary aim was to assess the frequency and the consequences of droughts in Slovenia based on drought events in the past, to develop methodology for drought vulnerability and risk assessment that can be applied in Slovenia and wider in South-Eastern Europe, to prepare maps of drought risk and crop vulnerability and to guidelines to reduce the vulnerability of the crops. Using the amounts of plant available water in the soil, slope inclination, solar radiation, land use and irrigation infrastructure data sets as inputs, we obtained vulnerability maps for Slovenia using GIS-based multi-criteria decision analysis with a weighted linear combination of the input parameters. The weight configuration was optimized by comparing the modelled crop damage to the assessed actual damage, which was available for the extensive drought case in 2006. Drought risk was obtained quantitatively as a function of hazard and vulnerability and presented in the same way as the vulnerability, as a GIS-based map. Risk maps show geographic regions in Slovenia where droughts pose a major threat to the agriculture and together with the vulnerability maps provide the basis for drought management, in particular for the appropriate mitigation and response actions in specific regions. The developed methodology is expected to be applied to the entire region of South-Eastern Europe within the initiative of the Drought Management Centre for Southeastern Europe.