RSHS18-54
Remote Sensing and Hydrology Symposium (ICRS-IAHS)

Monitoring Groundwater Flood Dynamics In Ireland Using Sentinel-1 Imagery

Ted McCormack (1), Owen Naughton (1,2), Rebecca Bradford (1,3), James McAteer (1,4)

(1) Geological Survey Ireland, Dublin, Ireland (ted.mccormack@gsi.ie), (2) Trinity College Dublin, Ireland, (3) Tobin Consulting Engineers, Dublin, Ireland, (4) GDG Geosolutions, Dublin, Ireland

The phenomenon of groundwater flooding represents a significant flood hazard for many rural communities in Ireland. Groundwater flooding is primarily associated with lowland karstified limestone areas prevalent in the west of the country. These areas are susceptible to groundwater flooding due to the combination of low soil and aquifer storage, high diffusivity and limited surface drainage characteristic of the region. Unprecedented flood events in recent years have reinforced the need for a greater understanding of groundwater flooding as a geohazard, and improve our ability to quantify the location and likelihood of flood occurrence. In response, Geological Survey Ireland has established a new collaborative groundwater flood programme (GWFlood) with University of Dublin Trinity College.

Key objectives of the GWFlood project are to monitor and map groundwater flooding in Ireland to an unprecedented extent. As groundwater flooding in Ireland tends to occur in isolated basins across the landscape, it is difficult and impractical to monitor using traditional field instrumentation techniques alone. Remote sensing approaches offer significant advantages in this respect and the availability of Copernicus EO data represents a practical and cost-effective alternative. In this context, Geological Survey Ireland is using imagery from the ESA Sentinel-1 mission to observe the dynamics of groundwater flooding over time.

The significant benefit of Sentinel-1 mission is the frequency of image capture; the satellites have been collecting uninterrupted imagery over Ireland at a 3-4 day revisit time since late 2014. While this revisit time may be inadequate for observing flash floods, which appear and dissipate within hours, it is suitable for monitoring groundwater flooding which occurs at a much slower rate. Groundwater floods typically appear and recede over a timescale of weeks to months. As such, the considerable catalogue of Sentinel-1 imagery available has allowed us to track groundwater flood development through time, increasing our understanding of this complex flood form and help identify vulnerable areas and communities.

This new programme will improve our understanding of the hydrodynamics and flooding potential of Irish karst systems and provide the fundamental hydrological data to enable key stakeholders to make better informed decisions regarding groundwater flood mitigation.