A125 Multi-Temporal Remote Sensing of Mass Graves in Temperate Environments

Emily A. Norton, MSc, Bournemouth University, Talbot Campus, Fern Barrow, Poole, Dorset BH12 5BB, UNITED KINGDOM; Andrew Ford, MSc, Bournemouth University, Faculty of Science and Technology, Fern Barrow, Poole BH12 5BB, UNITED KINGDOM; and Paul Cheetham, MSc, Bournemouth University, Talbot Campus, Poole BH12 5BB, UNITED KINGDOM*

After attending this presentation, attendees will understand how multi-temporal, multi-spectral, fine spatial-resolution satellite imagery and derived vegetation phenological metrics can aid in the location and detection of human mass graves in temperate environments.

This presentation will impact the forensic science community by potentially revolutionizing the way mass graves are detected. If successful, mass graves will be able to be detected efficiently over large areas and independent of physical or political borders. Furthermore, data processing and interpretation can occur remotely without having to deploy forensic teams to the field, thus bypassing major logistical and safety issues.

Mass graves resulting from mass disasters, human rights abuses, and war are worldwide, societal, and humanitarian issues which pose huge geographical issues and challenges to those responsible for their investigation. Existing published scientific literature detailing appropriate techniques is limited and scarce with the methods used often being ad hoc and based on available resources and finances rather than being the most scientifically appropriate.

Recent years have seen mass graves become a stimulant for criminal proceedings and investigations. Consequently, the detection of clandestine mass graves is at the forefront of international forensics and is considered of ever-increasing forensic importance.

This presentation will initially detail results relating to the investigation of phenological differences of a large-scale, proxy, decadal mass grave site resulting from the 2001 foot-and-mouth disease outbreak in the United Kingdom. This provides a pre-operational proof of concept for clandestine human mass grave detection in temperate environments using multi-temporal (18-day repeat period or multiple thereof), multi-spectral (visible and infra-red, .45 to 12.5µm), fine spatial resolution (30m ground sample distance) orbital remote sensing. A dense time-series of archive cloud-free Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper Plus (ETM+) satellite imagery (1999-2011) has been used in conjunction with imagery from the Disaster Management Constellation (DMC) imagery (2002-2011) to quantify phenology of the vegetation directly above the grave and the undisturbed vegetation surrounding it.

Results will also be presented which detail the application of the aforementioned imagery and method of the detection of clandestine human mass graves in Bosnia. In this instance, imagery from the early 1990s to the 2000s is used to cover the period of mass grave interment and exhumation resulting from the conflicts in the 1990s. Within-season and inter-annual phenological metrics (for exhumed human mass graves of known location) have been critically evaluated as a means of detection, which can in turn be applied to detection elsewhere.

Mass Grave, Remote Sensing, Phenology