Since late 2003, several East and Southeast Asia countries have experienced outbreaks of highly pathogenic avian influenza (HPAI, H5N1 subtype), or bird flu. By 6 April 2006, HPAI outbreaks had been reported in 45 countries over Asia, Europe and Africa, resulting in a total of 109 human death cases.

It is known that the H5N1 virus has now established an ecological niche or reservoir in domestic poultry. Domestic free-ranging ducks play an important role in the persistence and spread of HPAI, as the ducks can remain relatively healthy whilst excreting sufficient amount of H5N1 virus to sustain transmission. However, it is not clear what role wild birds and their migration play in the spatial spread and temporal dynamics of the HPAI epidemic over 2003-2006.

Migration timing and flyways of wild birds are affected by a number of biological and environmental factors, including habitat, condition of breeding, moulting, stop-over and wintering sites, and weather. Agricultural expansion has resulted in substantial losses of natural wetlands; however, agricultural intensification (double or triple cropping, irrigation), aquaculture (fish and shrimp ponds) and post-harvest management of paddy rice fields have generated complex farming landscapes that are now used by wild birds, in particular during the wintering period. In those closely interwoven farming and natural ecosystems landscapes, wild birds and domestic ducks are likely to mix and interact.

We are at the era of satellite Earth system observations and the emerging Global Earth Observation System of Systems (GEOSS), with 61 country participants offers an unprecedented opportunity to help understand the ecology of avian influenza, particularly in relation to wild birds, agriculture, domestic poultry, and biophysical and biochemical environments.

Here we present our effort in using satellite remote sensing (1) to quantify key ecological variables that affect migration timing and flyways of waterfowl and (2) to catalogue farming landscapes, ecosystems and interactions between these two forms of land cover. We present case studies in Asia to illustrate improved geospatial datasets of HPAI-relevant ecological factors, including agricultural systems (cropping intensity, crop calendar, and irrigation), seasonality of wetlands, and biophysical variables (e.g., land surface temperature, snow cover). These geospatial datasets can be used for better understanding the relationship between HPAI outbreaks and ecological variables, and for identifying potentially "hot-spots" (location-varying risks) and "hot-periods" (time-varying risk) of HPAI, which could substantially help targeted surveillance of wild birds and domestic poultry, risk assessment and early warning and response strategies.

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