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Airborne Animal Disease Atmospheric Dispersion System

Keith Lambkin (1), James Hamilton (1), Guy McGrath (2), and Roland Draxler (3)

(1) Met Éireann - The Irish Meteorological Service, Ireland, (2) CVERA - Centre for Veterinary Epidemiology and Risk Analysis, School of Veterinary Medicine, University College Dublin, Ireland, (3) NOAA/Air Resources Laboratory, College Park, Maryland, USA [retired]

A decision support system to aid in the risk evaluation of airborne animal diseases was developed for Ireland. The system's primary objective is to assist in risk evaluation of the airborne spread of Foot and Mouth Disease (FMD) as well as Blue Tongue Virus (BTV). The operational system was developed by Met Éireann - the Irish Meteorological Service and CVERA (Centre for Veterinary Epidemiology and Risk Analysis), in co-operation with DAFM (Department of Agricultural, Food and the Marine) and ARL-NOAA (Air Resources Laboratory - National Oceanic and Atmospheric Administration). The infrastructure largely relies on the HYSPLIT dispersion model driven by both ECMWF meteorological forecasts for overseas emission sources, and HARMONIE-AROME, a high resolution local area meteorological model, for national events. Following on from previous work by the Bureau of Meteorology, Australia, further modifications were made to the HYSPLIT source code to teach the model the behaviour characteristics of the Foot and Mouth Disease Virus. FMD is a highly infectious disease among cloven-hoofed animals that can transmit via airborne means. Biological characteristics related to temperature, humidity, lifespan as well as atmospheric washout were all incorporated either through new or existing functionality of the dispersion model. Combining the model dispersion capabilities of HYSPLIT with a virus emission model and GIS mapping software with farmland zoning, the disease dispersion system becomes a powerful analysis and decision support tool. Following on from observed advantages of the infrastructure, the system has been further modified to provide automatic daily updates of potential Blue Tongue Virus incursions to Ireland from overseas. Defining a dispersion particle to best match the behaviour of the culicoides midge, coupled with a sensible emission source to match midge numbers observations, the risk of airborne BTV infection into Ireland can be determined. This airborne animal disease atmospheric dispersion system, helps improve preparedness as well as aid confinement and eradication strategies for relevant Irish authorities.