Table S4.1. Summary of some existing trajectory/dispersion models and their application in invasion ecology– with additional information.

Trajectory/ dispersion model	Study subject	Application	Country and institute of origin	Meteorological data used	Spatial resolution of simulation (horizontal)	Spatial resolution of simulation (vertical)	Temporal resolution of simulation (time step)	Geographical area where model has been applied	Availability of model
SILAM (Leskinen *et al.*, 2011) http://silam.fmi.fi/	Pest: Bird cherry-oat aphid (*Rhopalosiphum padi*); diamondback moth (*Plutella xylostella*)	Early warning of pest arrival via long-distance dispersal events	Finland, Finnish Meteorological Institute (FMI)	HIRLAM and ECMWF numerical weather prediction (NWP). Other NWP data may be used to give a wider geographical area for application of the model	30 km	Modelled up to 2 km	15 min	Europe	Free and open source
HYSPLIT (Garner *et al.*, 2006; Zhu *et al.*, 2006; Kim and Beresford, 2008; MacRae *et al.*, 2011; Eagles *et al.*, 2013; Otuka, 2013) http://ready.arl.noaa.gov/HYSPLIT.php	Pathogen: Wheat stripe rust (*Puccinia striiformis*); FMDV Pathogen/vector: Bluetongue/ *Culicoides* Pest: Green peach Aphid (*Myzus persicae*); rice planthoppers (*Laodelphax striatellus, Sogatella furcifera* and *Nilaparvata lugens*)	Identification of sites at which rust spores are likely to be deposited after transit from Australia to New Zealand Risk assessment of windborne spread of FMDV, to allocate activities like surveillance and vaccination on a risk basis Relate spring low-level jet streams to intensity of *M. persicae* flight activity and spread of PLRV and PVY Migration source of rice planthoppers and *Culicoides*	USA, National Atmospheric and Oceanic Administration (NOAA)	NCEP/NCAR re-analysis data (wheat stripe rust and *Culicoides*), LAPS (FMDV). Can also use a range of other data sources	$0.1° \times 0.1°$ NCEP/NCAR re-analysis = $2.5° \times 2.5°$	Model output field resolution varies according to the model, anywhere from standard pressure levels (1000, 925, 850 hPa) to every 25 hPa intervals for the regional models	6 hourly	Global (NCEP/NCAR)	Free (use of forecast meteorological data requires registration and permissions)
PMTRAJ (Rochester *et al.*, 1996; Deveson *et al.*, 2005; Anderson *et al.*, 2010; Parry *et al.*, 2011; Eagles *et al.*, 2012)	Pest: *Helicoverpa punctigera* and *Helicoverpa armigera*; Australian plague locust (*Chortoicetes terminifera*); planthopper (*Eumetopina flavipes*) Pest/vector: Aphid (*Rhopalosiphum padi*) Pathogen/vector: Bluetongue/ *Culicoides*	The basis of a system for forecasting moth migrations from inland habitat to coastal cropping regions The identification of dispersal mechanisms which facilitate particular biological invasions Tracing locust pest outbreak source	Australia, CSIRO	LAPS, replaced in late 2010 by ACCESS-based models http://www.bom.gov.au/nwp.doc/access/NWPData.shtml	0.75° LAPS. ACCESS provides finer resolution, to 0.11° for Australia or coarser at global (80 km approx)	LAPS: 29 vertical levels ACCESS: 35 pressure levels, 29 sigma levels, 50 vertical hybrid-height levels	6 hourly	With LAPS, data = Australasian region (65S–16.75N, 65–184.25E) With ACCESS, data = from Australia to global	Free (licence required from CSIRO)
TAPM (Hurley *et al.*, 2005; Savage *et al.*, 2010)	Fungal pathogen (generic)	Determine whether changes to the seasonal and circadian timing of propagule release can have a significant effect on the area covered by resulting aerial dispersal	Australia, CSIRO	LAPS, to be replaced in late 2010 by ACCESS-based models http://www.bom.gov.au/nwp.doc/access/NWPData.shtml	0.75° LAPS or GASP	LAPS: 29 vertical levels	6 hourly	Global (with limits). Restricted to 1500 km × 1500 km domain	Licence required from CSIRO at cost

Trajectory/ dispersion model	Study subject	Application	Country and institute of origin	Meteorological data used	Spatial resolution of simulation (horizontal)	Spatial resolution of simulation (vertical)	Temporal resolution of simulation (time step)	Geographical area where model has been applied	Availability of model
CMC (LRTAP) (Hopkinson and Soroka, 2010)	Pest: Diamondback moth (*Plutella xylostella*)	Use of both forward and back trajectories to identify likely sources of pest outbreaks	Canada, Canadian Meteorological Centre (CMC)	Meteorological Service of Canada's Global Environmental Multiscale (GEM) model	0.9°	28 vertical levels	3 hourly	Global	Contact CMC
CALPUFF (Pfender *et al.*, 2006) http://www.src.com/calpuff/calpuff1.htm MM5 (Hu *et al.*, 2013)	Pathogen: Grass stem rust (*Puccinia graminis*) Pest: Brown planthopper (*Nilaparvata lugens*)	Estimation of dispersal and deposition of grass stem rust at a landscape scale	USA, TRC, Lowell, Massachusetts	MM5, RUC or NAM/WRF real-time forecast data	MM5: 12 km RUC: 13 km NAM/WRF: 8–40 km	MM5: 40 vertical half-sigma levels RUC: 50 isentropic-sigma hybrid vertical levels NAM/WRF: surface, 1000–200 hPa, 9 levels	MM5: hourly RUC: hourly	Only MM5 global (with limits). Others USA region only	Free limited-use license
NAME (Ågren *et al.*, 2010; Chapman *et al.*, 2010) (now NAME III) http://www.metoffice.gov.uk/research/modelling-systems/dispersion-model	Pest: *Autographa gamma* moths Pathogen: *Culicoides* midges/ Bluetongue virus, FMDV	Trajectory analysis in combination with radar data showed that moth behaviours alter migration distances and directions of seasonal migration Estimation of likely source of bluetounge introduction to Sweden from Europe and likely points of introduction	UK, Met Office	The model uses archives of wind fields and other meteorological data generated by the Met Office's NWP model, the Unified Model	As of 2010, the resolution is now: Global: 25 km North Atlantic/ Europe: 12 km UK: 4 km	As of 2010: 70 vertical levels	10 min	Global	Contact UK Met Office

FMDV, foot-and-mouth disease virus; PLRV, potato leafroll virus; PVY, potato virus Y; NCEP/NCAR, National Center for Environmental Protection/National Center for Atmospheric Research; LAPS, Limited Area Prediction System; ACCESS, Australian Community Climate and Earth-System Simulator.