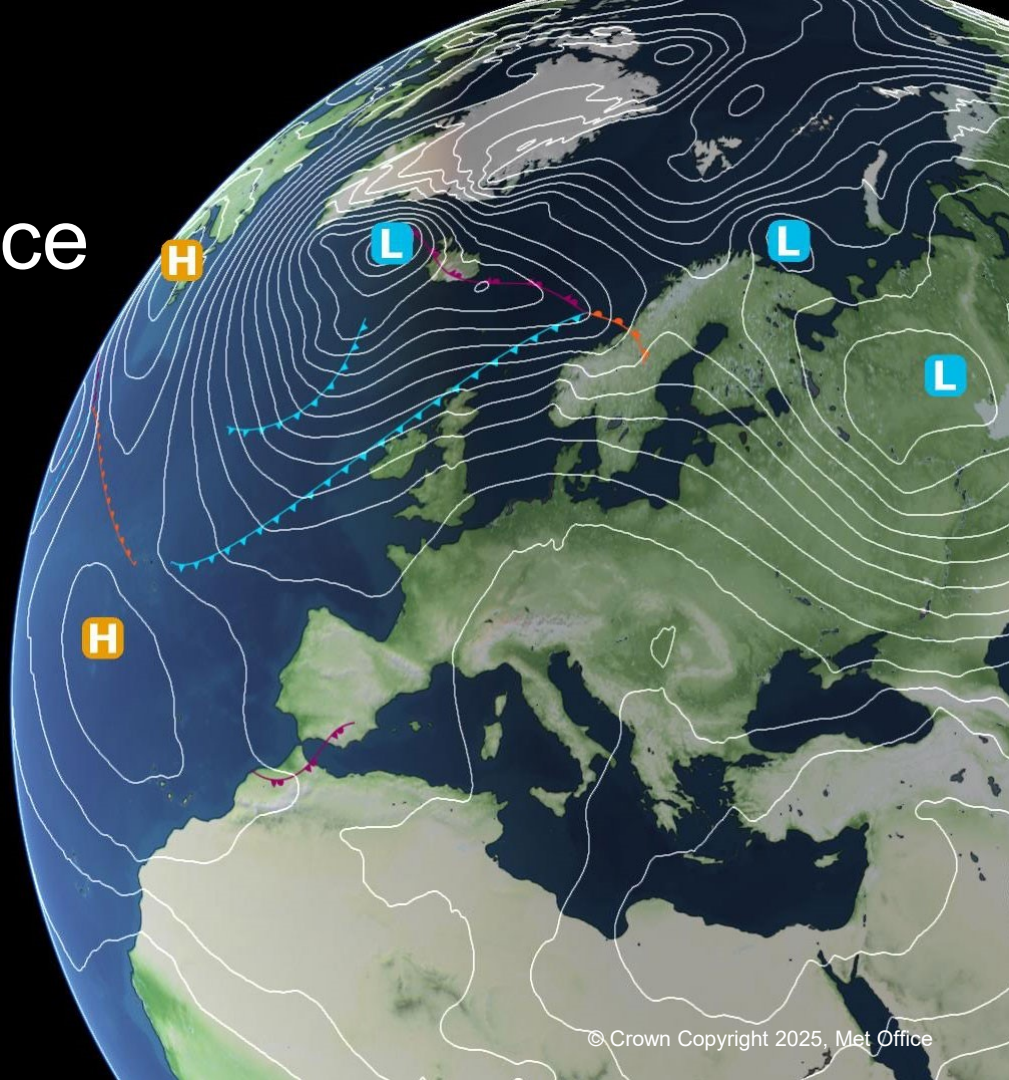
Update from the Surface Module

John Edwards and Rich Ellis

JULES Science Meeting

September 2025

Leicester



Met Office

- Little scientific development over the past year because of work on porting to the new HPC and developing for LFRic

- Tickets included
  - Vn7.7: #1500 Consolidation of code for variable blending heights
  - Vn7.8: #1575 Passing the urban emissivity from LFRic to JULES

Met Office

Forthcoming Work

- Urban anthropogenic heat flues (next slide)
- Cryospheric developments
  - Increasing focus on the Arctic will require improvements to the cryosphere in JULES
  - I will say something about modelling the Arctic in LFRic and the snow scheme in another talk on Wednesday
  - Sarah Shannon at Reading is starting work on a melt lake model for JULES for Antarctic applications under the ExtAnt project

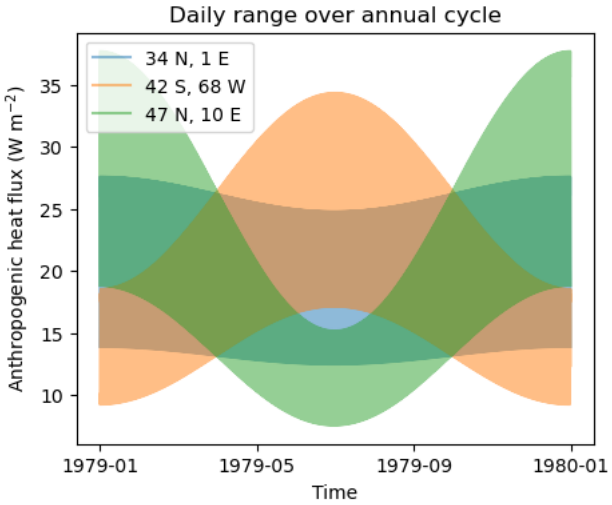
Urban anthropogenic heat flux

Katty Huang, Andy Wiltshire, Maggie Hendry

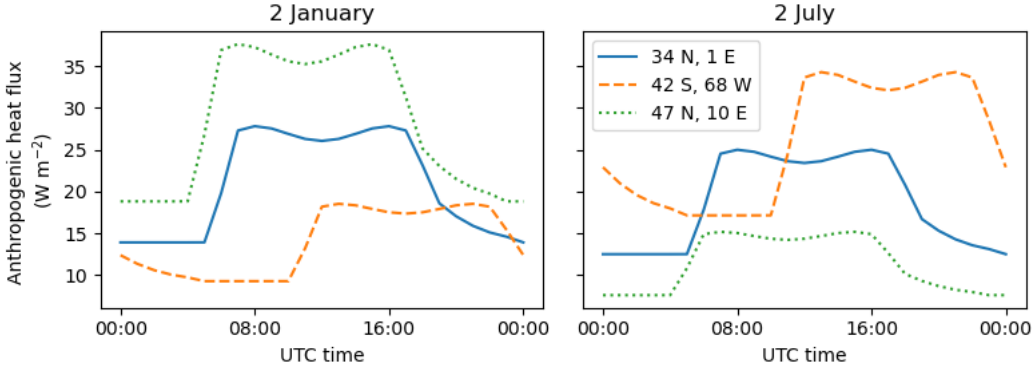
- Ticket #1371 under review and to be lodged into the trunk
- Added Flanner (2009) option for calculating urban anthropogenic heat flux

- ➢ Seasonal cycle when | lat | > 33°, increasing in magnitude with latitude
- ➢ Diurnal cycle with simple longitude-dependent time zone offset

Seasonal cycle



Diurnal cycle



Blue: minimal seasonal cycle, no time zone offset

Green: greater seasonality, slightly ahead in time zone

Orange: inverted seasons, behind in time zone

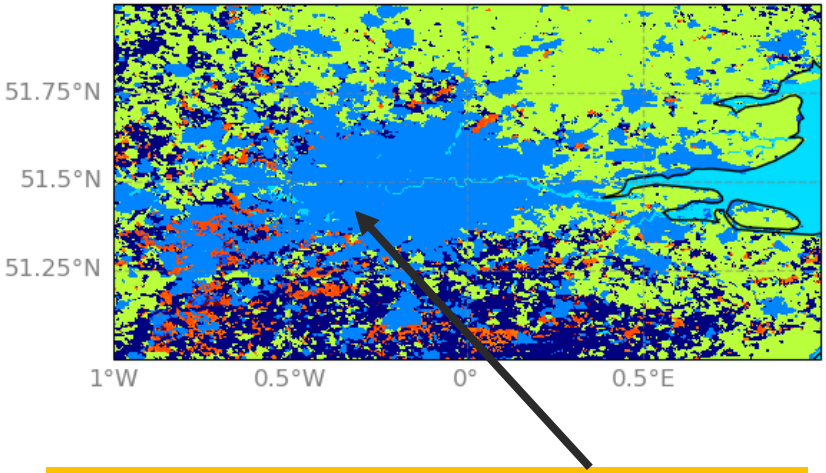
Ancillary Developments

Met Office

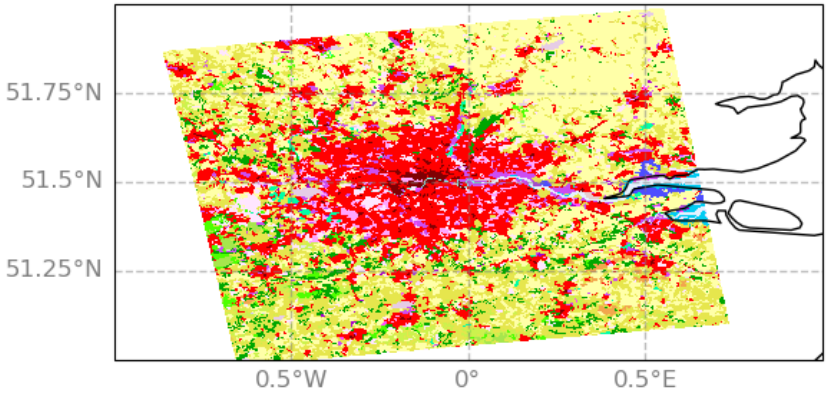
- Ancillary data constitute an important input to JULES for gridded forecasting runs
- Processing of these data has traditionally been difficult
- ANTS has been developed as a python-based system to improve this and allow us to use a wider range of sources
- Significant work is being undertaken at the Met Office to improve our ancillaries
  - E.g. Use of WorldCover data for high-resolution urban modelling
  - Developing work on orography, vegetation data and soils

Urban Areas

London



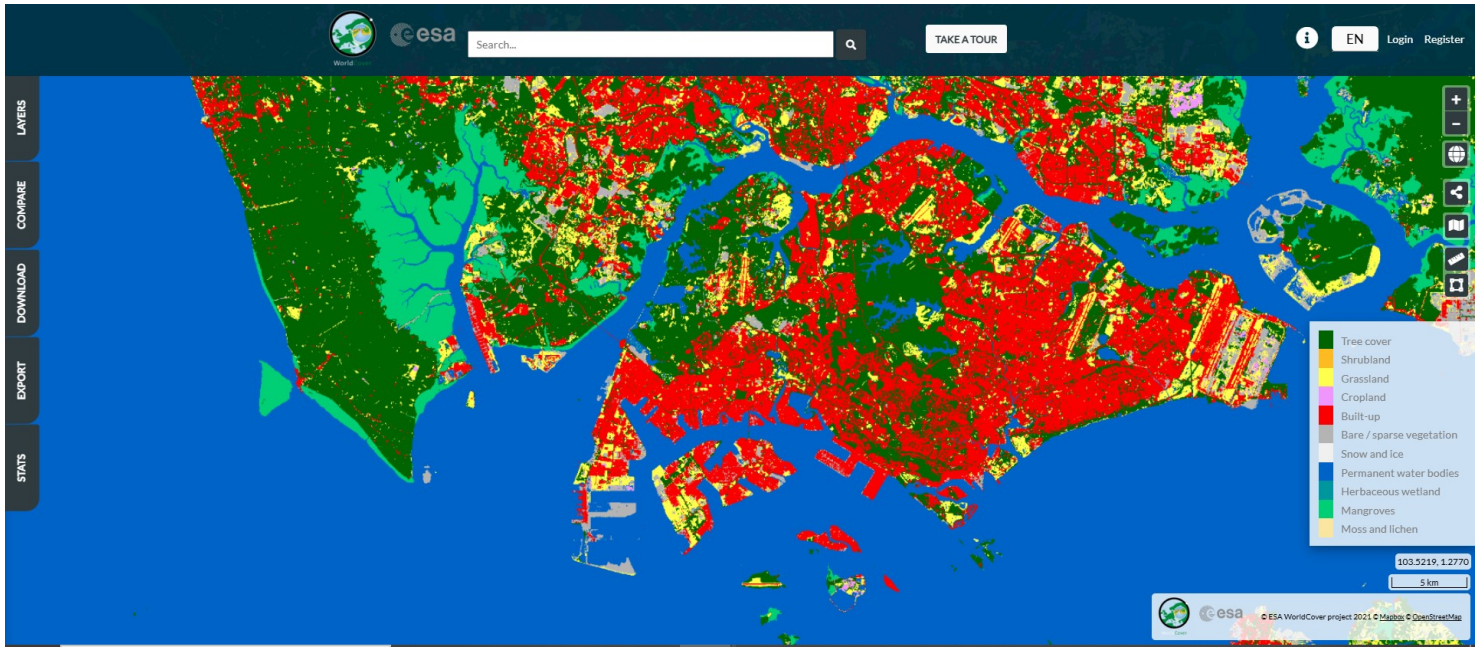
Default CCIv1p6 has a single urban class, including suburbs



Other data sources, e.g. CORINE, have more discrimination

High-resolution Land Cover Data

- ESA World Cover at 10 m
- Processed into urban fraction at various resolutions (Patel & Roth, 2022)



Starting to be used at the Met Office and CCRS, Singapore