

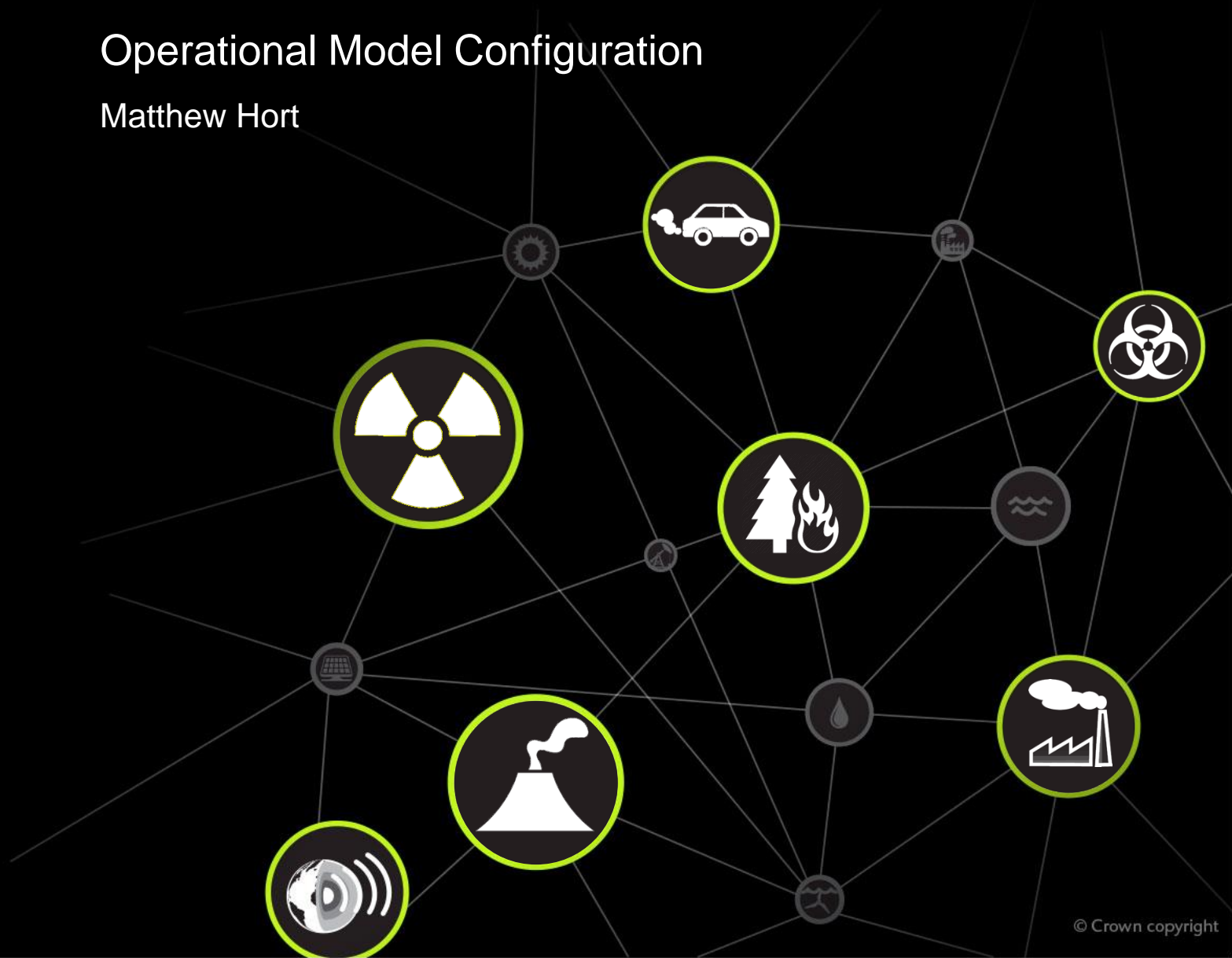


Met Office

VAAC-BP 2016

Operational Model Configuration

Matthew Hort





VAAC Operational Modelling

VWO06 Update VAAC 'Ins and Outs' Modelling tables.

VWO07 All VAACs in coordination with the relevant NWP provider(s), to further investigate and report on NWP errors/performance

VAAC Operational Modelling

- Inputs and Outputs Dispersion Modelling Workshop, 5-9 Nov 2012
- Range of recommendations
- Tables compiled to act as a ‘snap shot’ of operational modelling configurations
- Aim:
 - To contribute to Best Practice
 - To help encourage adoption of and also drive developments in research

VAAC Operational Model Configuration

Some 'Inputs and Outputs' outcomes

- IOWO 01 – NWP
 - Access to NWP up to minimum 30 km altitude
 - Multiple sources of NWP and investigation of errors
- IOWO 07 – Model predictions of plume top and bottom
- IOWO 08 – Use of wet deposition processes
- IOWO 10 – Mass column loading output
- IOWO 11 – Time averaging of less than 3 hours
- IOWO 14 – Ensembles



2016 Operational Configurations

Source Characterisation

- Eruption column
 - Horizontal Dimensions – most using a point
 - Vertical distribution – most still uniform
 - Umbrella cloud
- Distal ash as source – some
 - What mass/concentration used?
 - Need to be clear on purpose and utility of different approaches
- Emitted parameter – All able to use MER
 - Total/Fraction/Unit
 - Not all outputting mass related products?
- Multiple eruption phases – still not all
 - How would they deal with a long duration eruption?

Species Properties

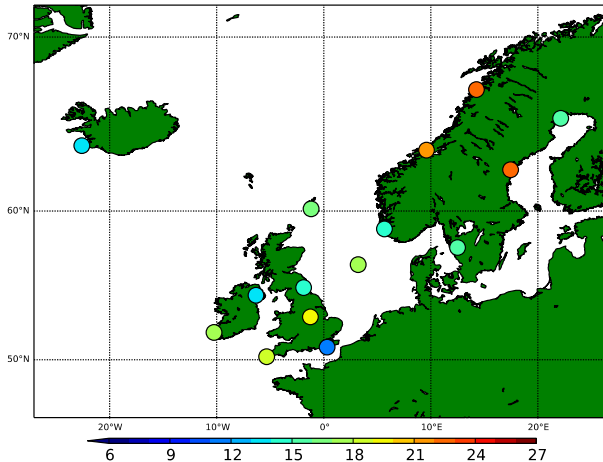
- All now modelling plume as particles
 - Sedimentation
- PSD still rather varied:
 - Many 0.1 – 100 but other 10-100, 0.6-20, 0.65-65 microns
 - PSD Bins – discreet or continuous?
- Less variation in density
- 3 VAACS using non-spherical particles
 - Is this default?
 - What setting?
 - What led them to do this?

NWP Data Used by VAAC

- All have global NWP data
- All using 3 hourly or better time step NWP (Bowman et al 2013)
- Resolutions improved at many
 - Any using down sampled data?
- Lowest NPW top now ~ 28 km asl
- Wellington made big changes – higher resolution and more sources
- NWP errors (VAAC BP (Westminster 2015) VWO07 action)
 - It is important that we understand our NWP
 - Regional models may offer pros and cons (Becket et al 2015)

NWP

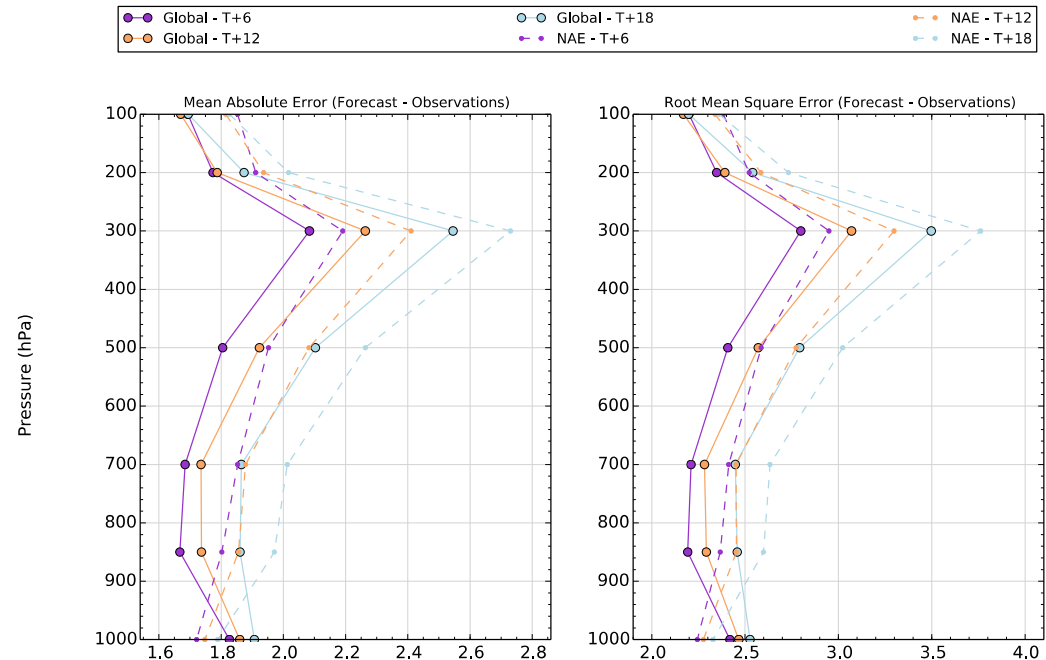
Evaluation of Skill



“UM Global model configuration has been shown to be consistently more accurate than UM LAM output at forecasting upper air winds over the area of responsibility covered by the London VAAC.”

(Beckett et al 2015 – MetO Futurevolc report)

Wind speed (m/s) for 2010 00Z and 12Z sondes



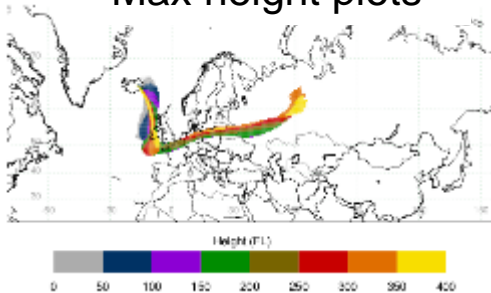
Dispersion Model Processes

- Wellington – changed model
- Key processes
 - Vertical winds – all explicit NWP
 - Wet deposition
 - Not all and some in-cloud only
 - Sedimentation
- ‘Research’ processes
 - Aggregation

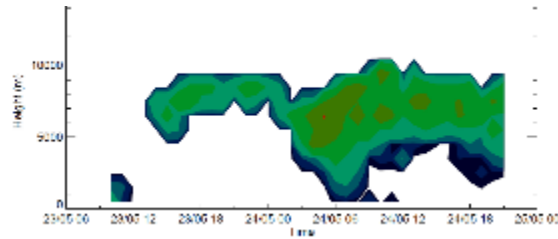


Model Outputs

Max height plots

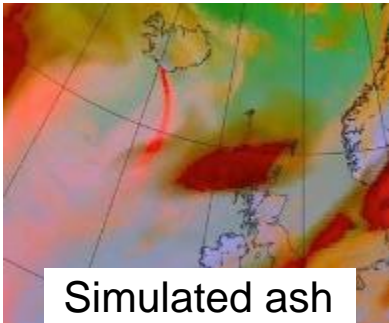


Lidar “look-alike” plots



- Range of resolutions (Horiz and Vert)
- More are outputting concentrations and column loadings
 - How being used?
 - What about other outputs - height, Lidar, etc?
- Standard forecast length
 - 24→120 hours – potential impact on speed of service
- Time interval/averaging time
 - Majority using 1 hour average
 - IOWO 11 – not yet implemented by London

Simulated ash



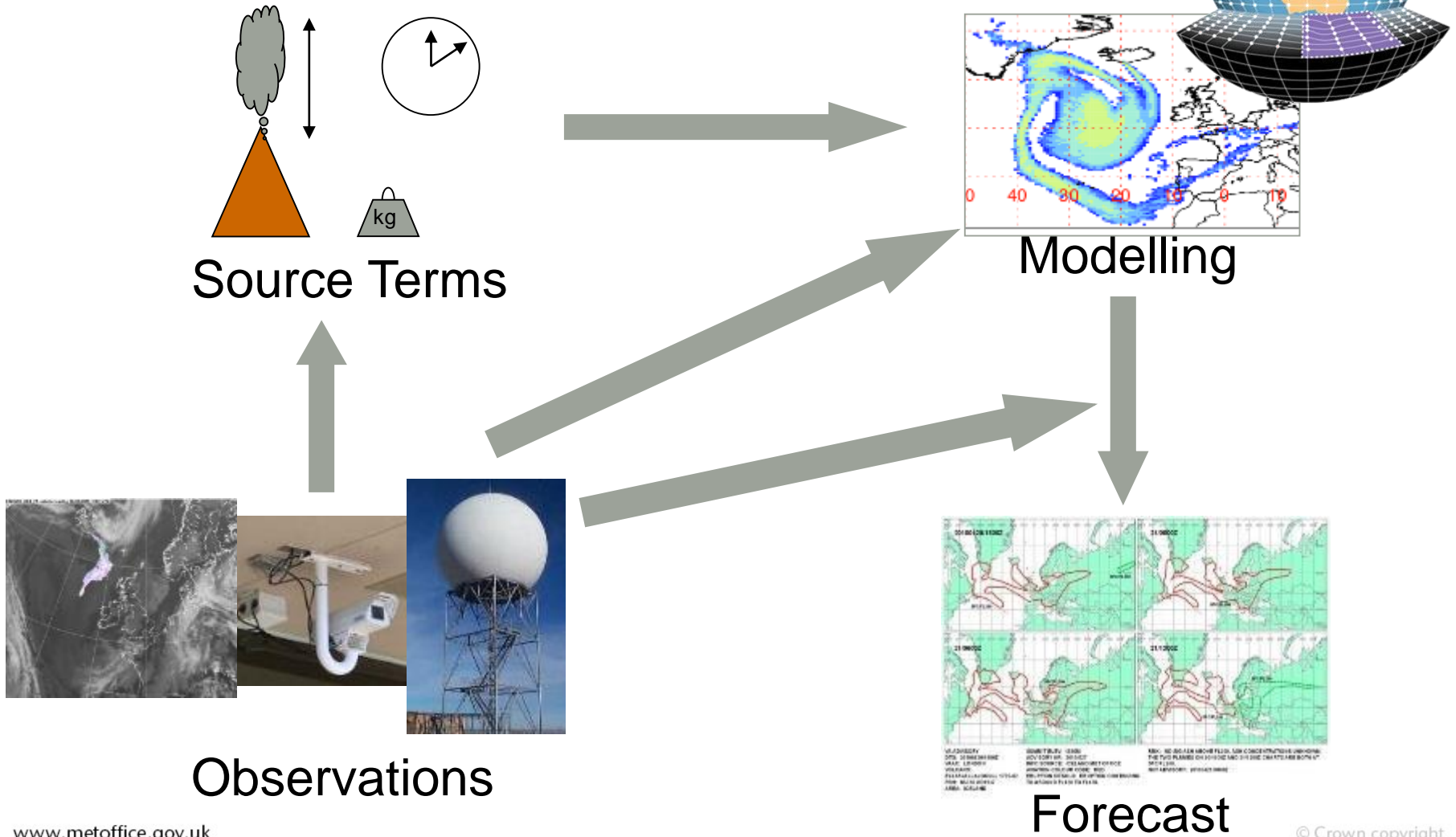
Computational Details

- 24 hour forecast
 - Between 1 - 10 minutes elapsed time
 - CPU time 5 – 150 minutes (be careful – not this simple)
- Actual forecast durations place higher demands in some area.
- Run times are short enough with modern multi processor computers to allow ensembles
 - Obviously logistical challenges
 - Thoughts on use/utility



Some longer term thoughts

Forecast Process



Longer term

- Modelling strategies
 - Processes, parameterisations, etc
- NWP exploitation
 - Δt , parameters, ensembles
- Inversion/DA
 - Proximal and distal; multi platform
- We need meetings/collaboration focused on these 'longer term' research driven developments
- Sharing of publications also beneficial