Requirements of the UK Met Office for Land-SAF products

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This presentation covers the following areas

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- NWP plans and requirements
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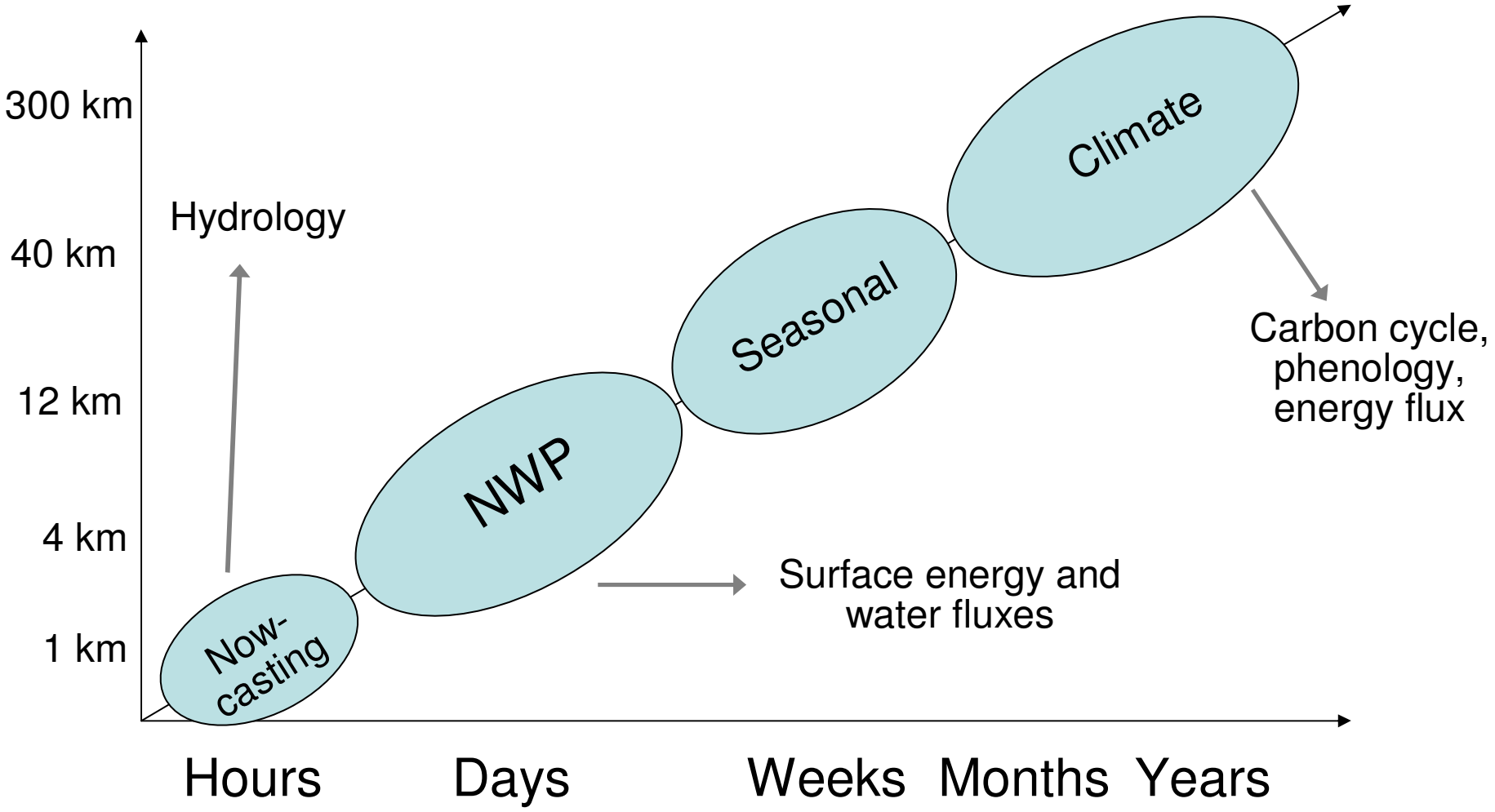
  - Requirements
- Climate requirements
- Summary

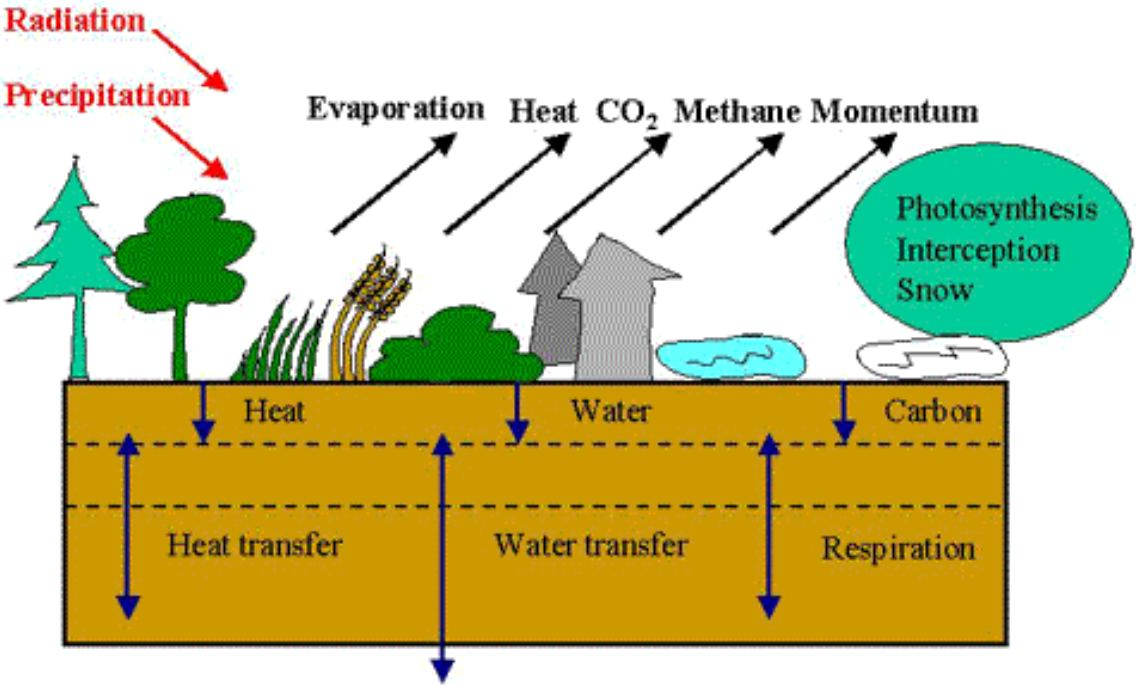
How important is the land surface?

- Growing recognition of the importance of the land surface in GCMs from nowcasting to decadal climate modelling
- Land surface characterisation - better modelling and specification needed
- Land surface responses to climate change are important
- Observational data needed on range of scales and coverage
- Uses: validation, monitoring, data assimilation, ancillary data, forcing, understanding processes

Met Office Unified Model



Surface exchange model development



- Multi-layer land surface model
- Multi-layer snow model
- Lake model
- River routing scheme
- Dynamic vegetation model
- Phenology
- Observations – radiances, retrieved products, in situ

Variational surface assimilation system with observation operators (radiative transfer model for surface emission)

Coupled to atmospheric model at lowest atmospheric level

NWP plans and requirements

The land surface so far…

Until recently land surface characteristics in NWP models have been mainly prescribed by climatological and empirical datasets, or allowed to evolve freely without observational constraints.

e.g. at the Met Office:

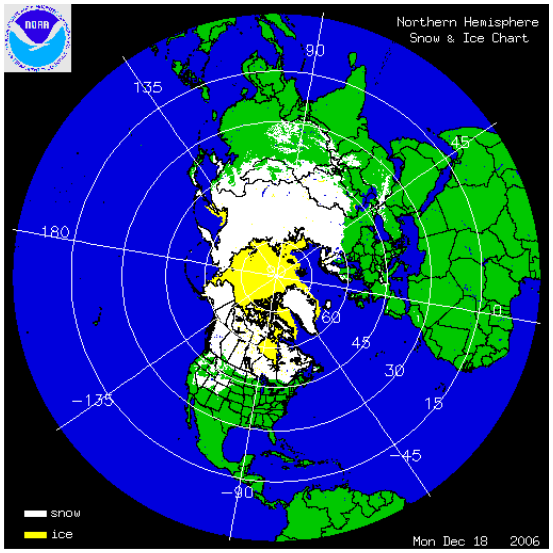
- Soil moisture – nudged from screen T and RH analysis
- Vegetation characteristics – seasonal climatology
- Snow amount – freely evolving

Now efforts are focused on developments to land surface modelling and data assimilation.

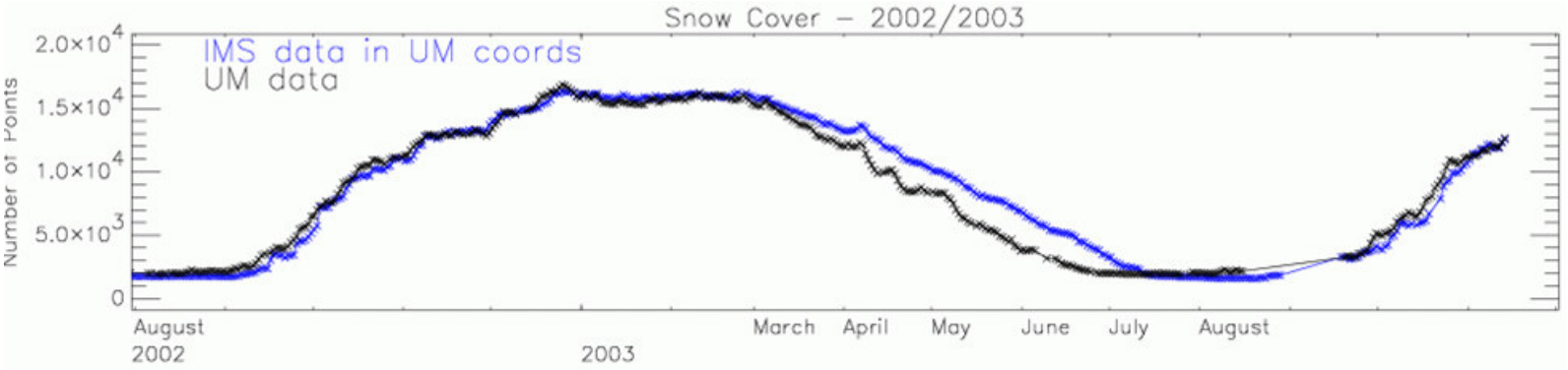
Current and future developments

- Snow cover: NH snow analysis using NESDIS IMS data (2008)

NH snow analysis

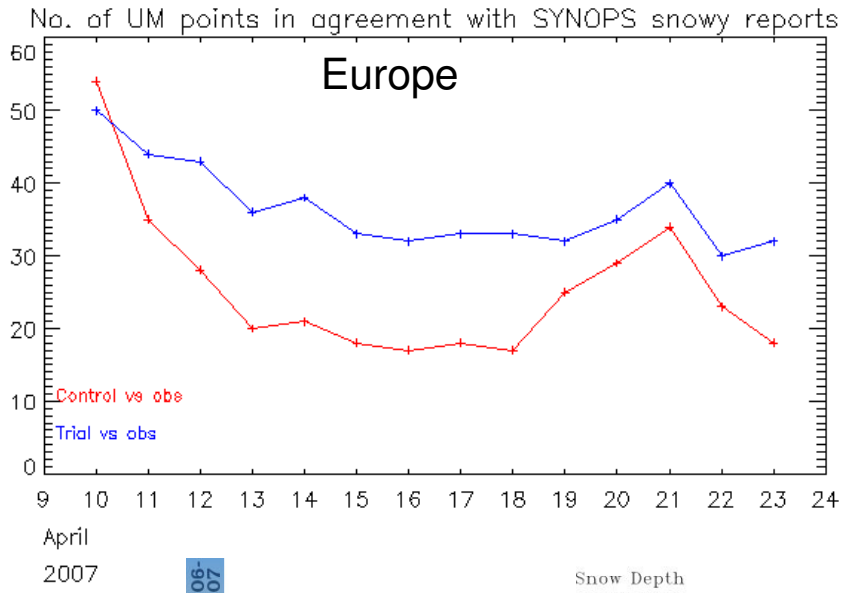


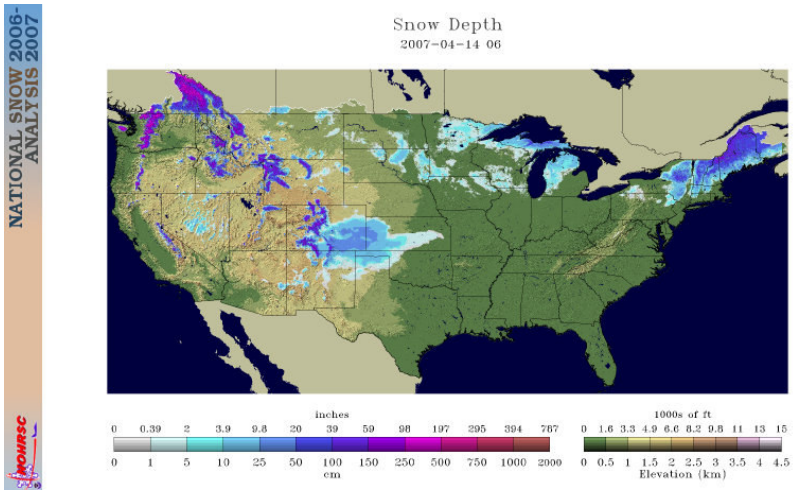
- NESDIS Interactive Multisensor Snow and Ice Mapping System (IMS)
- Daily 4km NH snow cover, variety of sources
- Used to adjust model snow where IMS and model first guess disagree as to presence of snow
- Create fractional cover, relate this to SWE to decide how much snow to add
- UM underestimates amount, overestimates variability, melt ~3 weeks early, Tibetan Plateau overestimation



Assimilation trials

- NH winter positive impact
- NH spring neutral
- Verifies well against SYNOPS snow reports
- Information not retained
- Operational 2008 (Oct)





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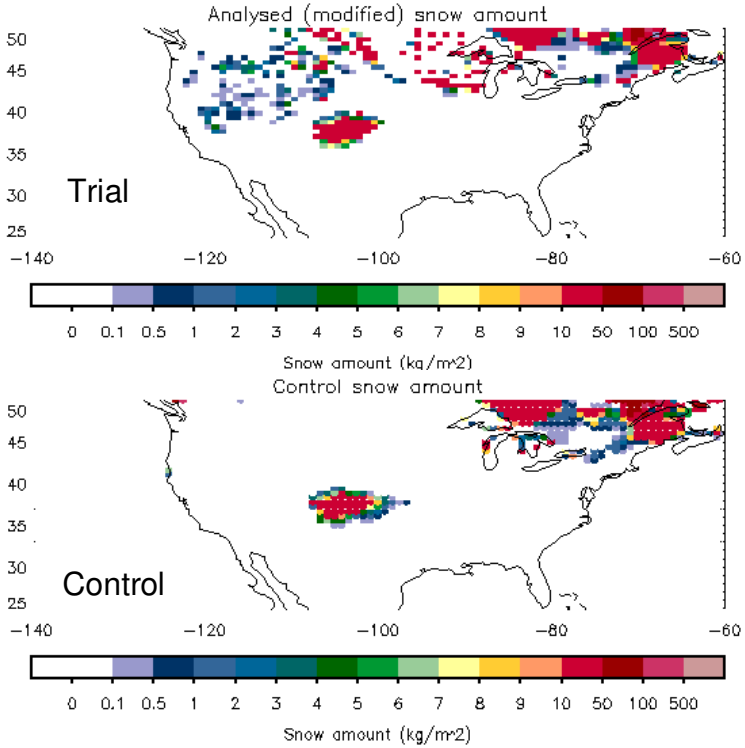

But…data time lag

Met Office

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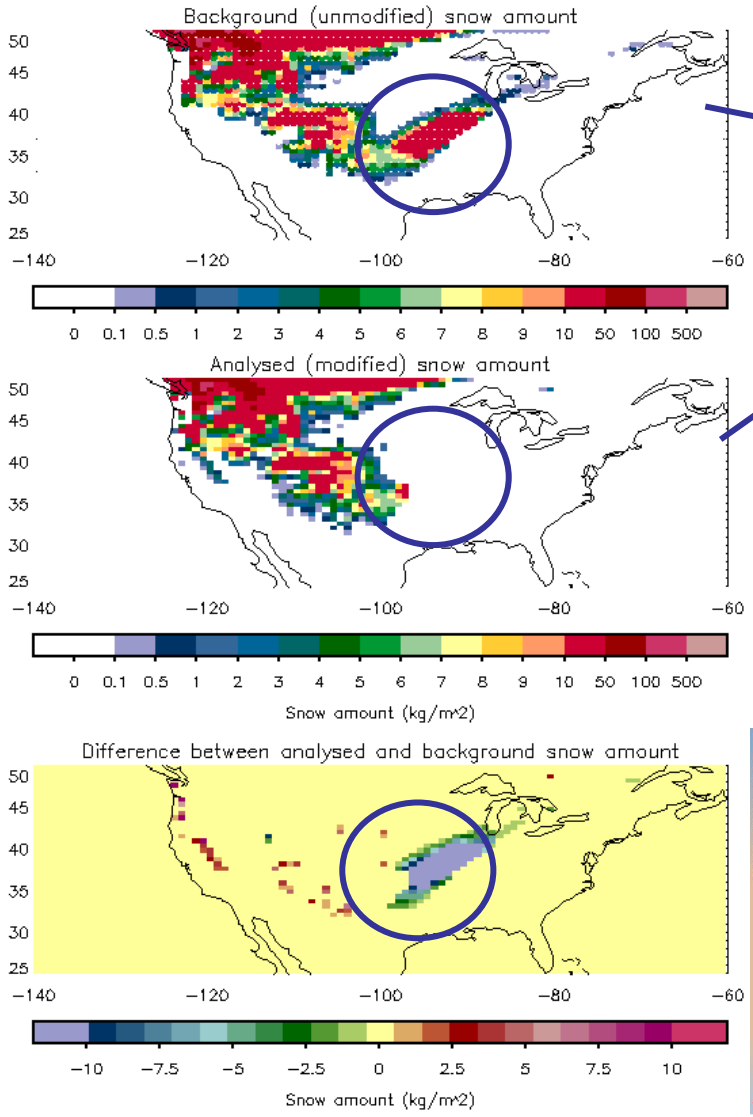

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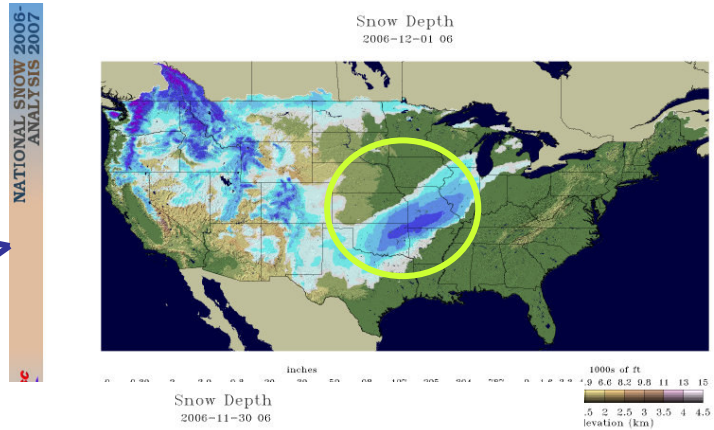

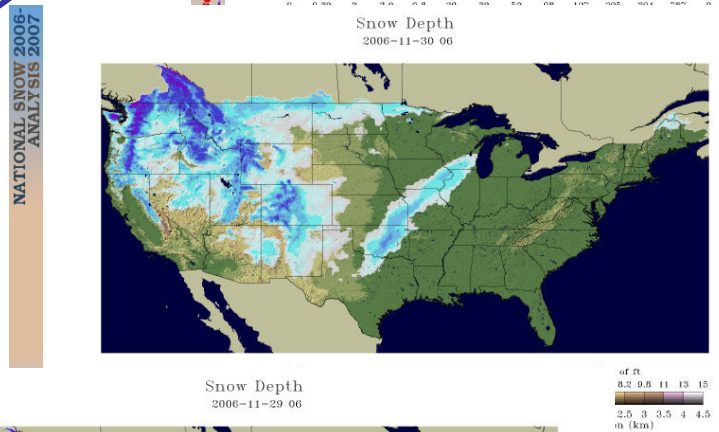

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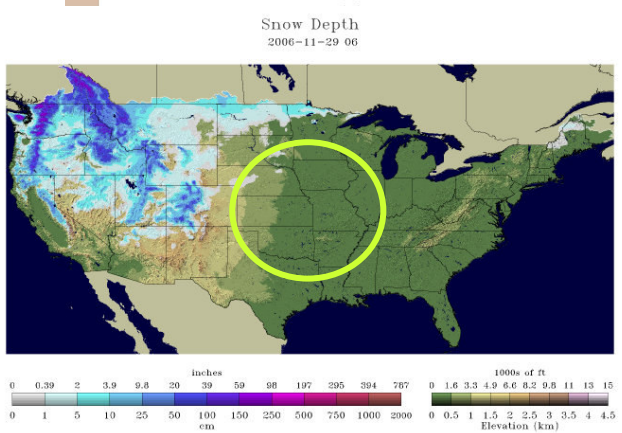

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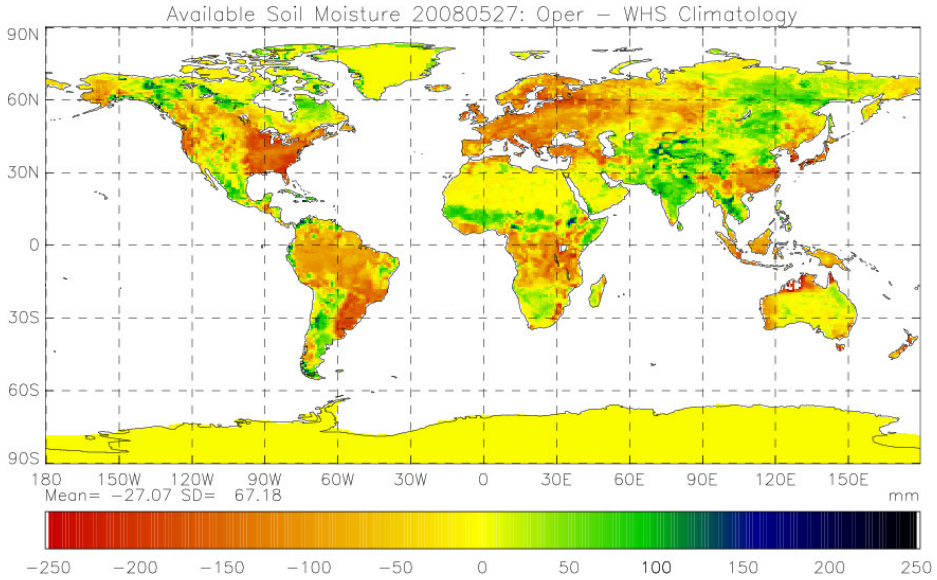
Current and future developments

- Snow cover: NH snow analysis using NESDIS IMS data (2008)
- Soil moisture: ASCAT (and SMOS) soil wetness assimilation (2009?)

Soil moisture

Current soil moisture anomaly



Soil moisture is very high priority

- Global model – screen analysis nudging technique
- High resolution models - soil moisture driven by precipitation and radiation
- Too dry NH mid-lats, SH deserts

•Plan to assimilate ASCAT soil wetness, 2009? (global model)

•Interested in SMOS products when available

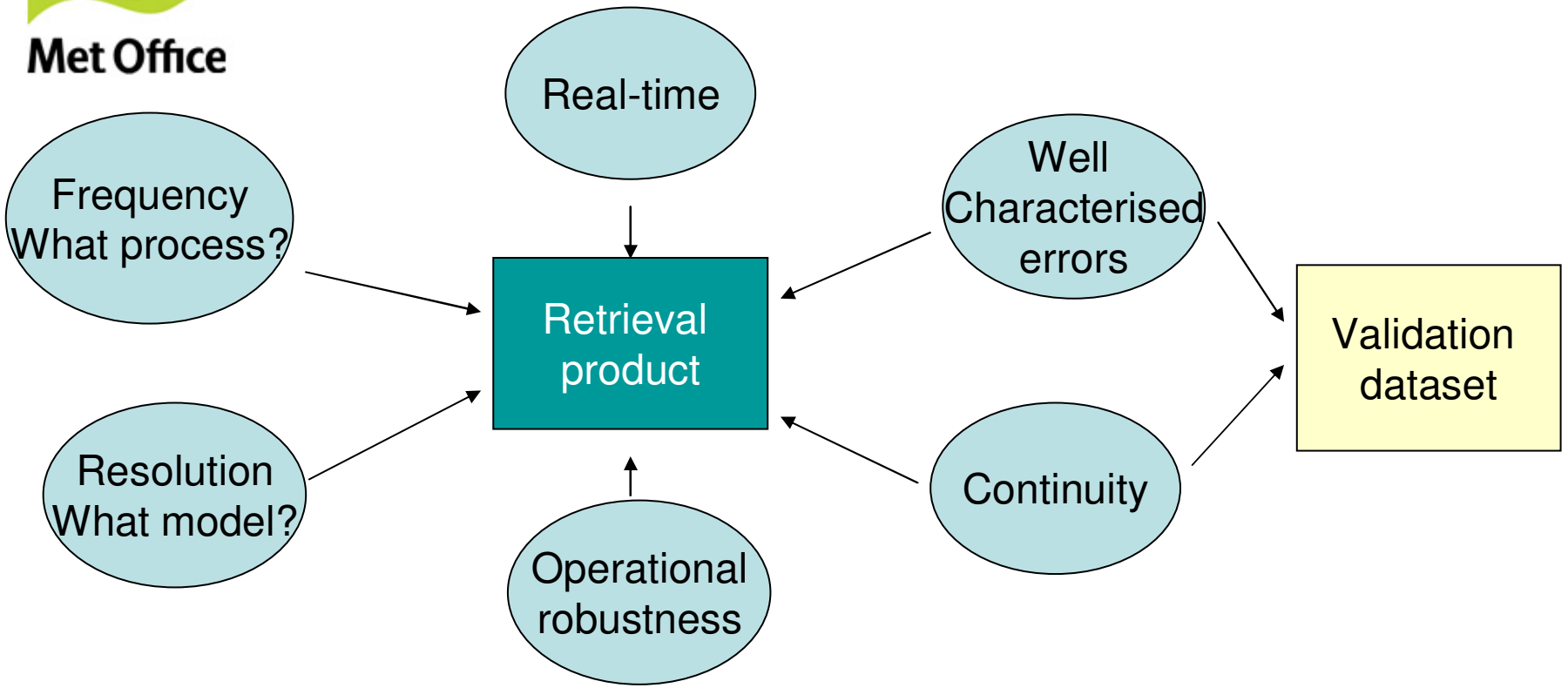
•Related vegetation products: real-time LAI, better surface type classification, faPAR, evapotranspiration rates could be used in addition

•Ideally require accuracy within 5%, daily

Current and future developments

- Snow cover: NH snow analysis using NESDIS IMS data (2008)
- Soil moisture: ASCAT (and SMOS) soil wetness assimilation (2009?)
- Vegetation: LAI assimilation (2010)
- LST, snow depth, faPAR assimilation (??)
- Modelling – snow scheme, soil hydraulics, lake tile, tiled surface for global model, coastal tiling

Requirements for NWP



What we particularly want from LandSAF:

- Global coverage
- Near Real Time – within 24 hours

Climate requirements

The land surface in climate applications

Main areas of interest:

- Carbon stores
- Phenological responses

Interest in all vegetation-related, and other surface observations for:

- Model validation – e.g. validating changes in plant responses (short timescale), snow cover, LSTs
- Forcing/driving – e.g. land use changes for driving models (all space scales, short timescales), soil moisture, snow cover

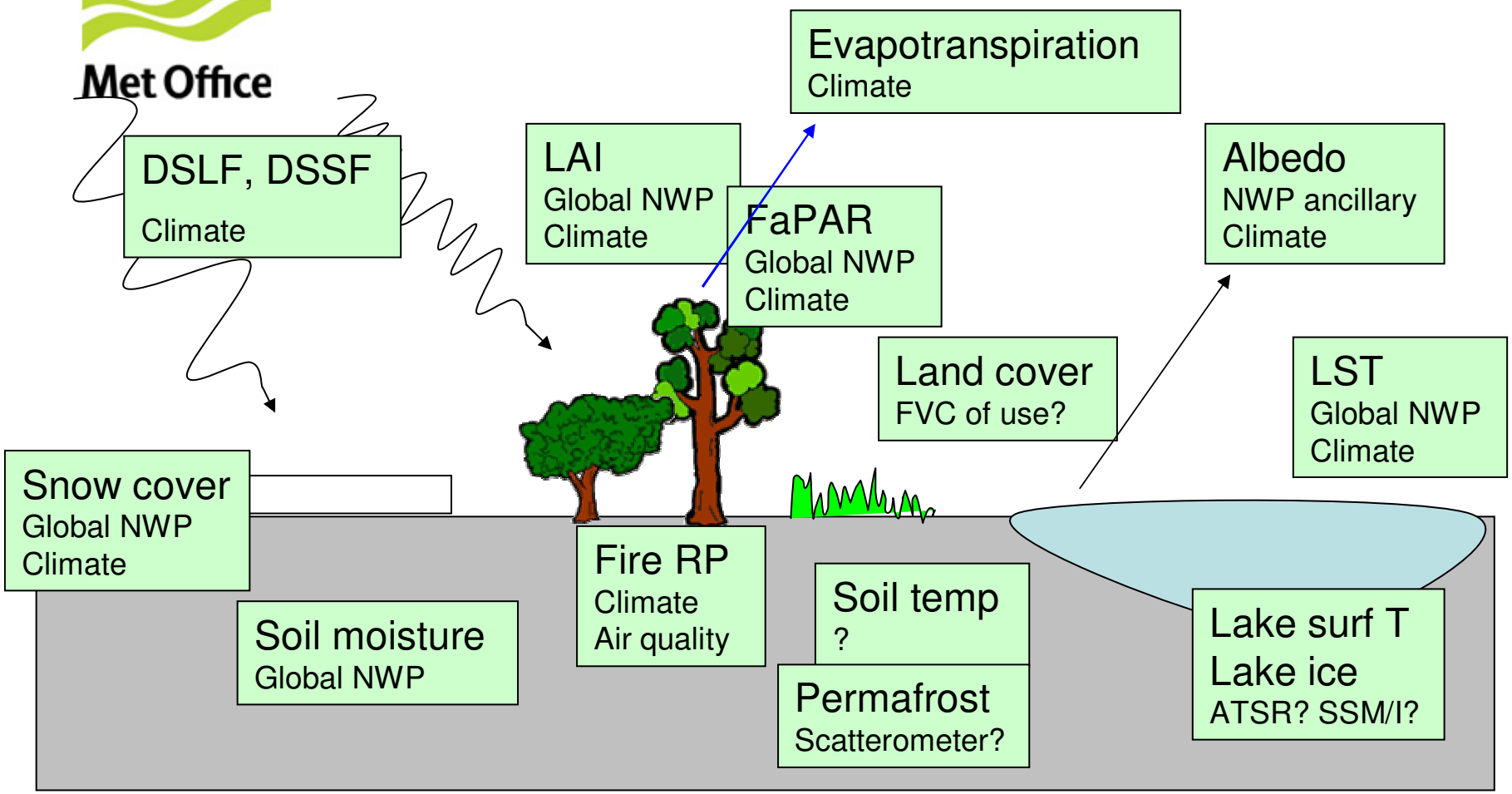
Continued…

- Monitoring – e.g. continuous climate records of land-use change, rainforest degradation (monthly to interannual), snow cover (global, continuous)
- Reanalysis tools – capability to reprocess historical datasets for reanalysis purposes – very important for climate records, e.g. snow cover, soil moisture, vegetation
- Understanding processes – e.g. carbon stores from fire radiative power
- Constrained by how model-driven some of the products are, e.g LAI. Requires inverse modelling to make use – better to simulate satellite radiances for direct quantitative comparisons

Summary

- Development of land surface modelling and data assimilation now high priority in NWP.
- Land surface responses are understood to be at least as important as cloud feedbacks in the climate system.
- Requirement for land surface products for real-time, operational assimilation, ancillary data, validation, monitoring, driving climate models, understanding physical processes, and for reanalysis tools.
- Although regional data can be useful for validation, and assimilation into regional models, we need global coverage to make full use of LandSAF products.

We are interested in……



…most are planned by LandSAF, but we do need global coverage to make real use of them.

Questions and answers