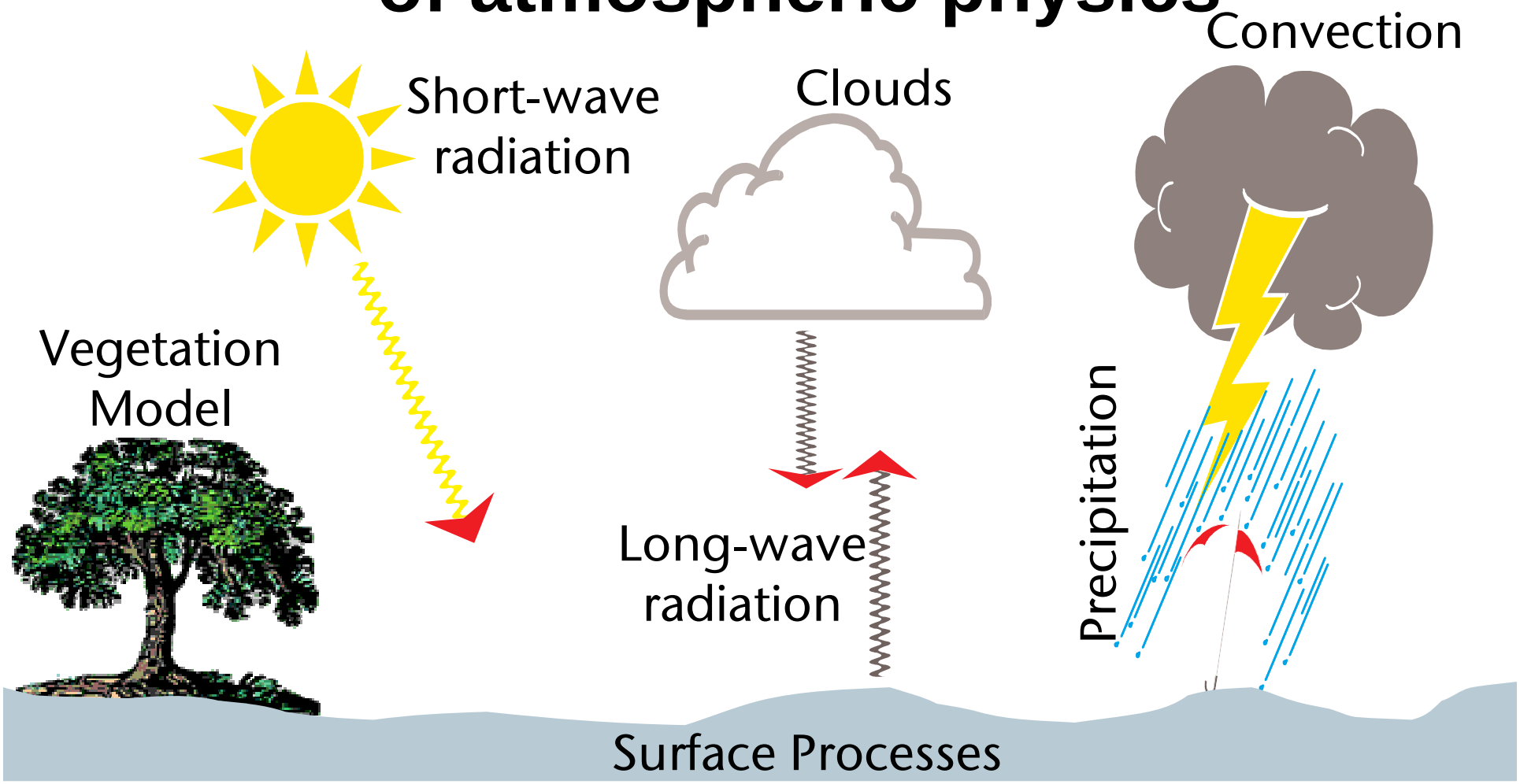
Regional modelling

Modelling: expressing our knowledge of atmospheric physics



Mesoscale Processes

- Convergence
- lake/sea breezes;
- orography;
- surface processes (soil moisture, vegetation, etc);
- diurnal cycle,

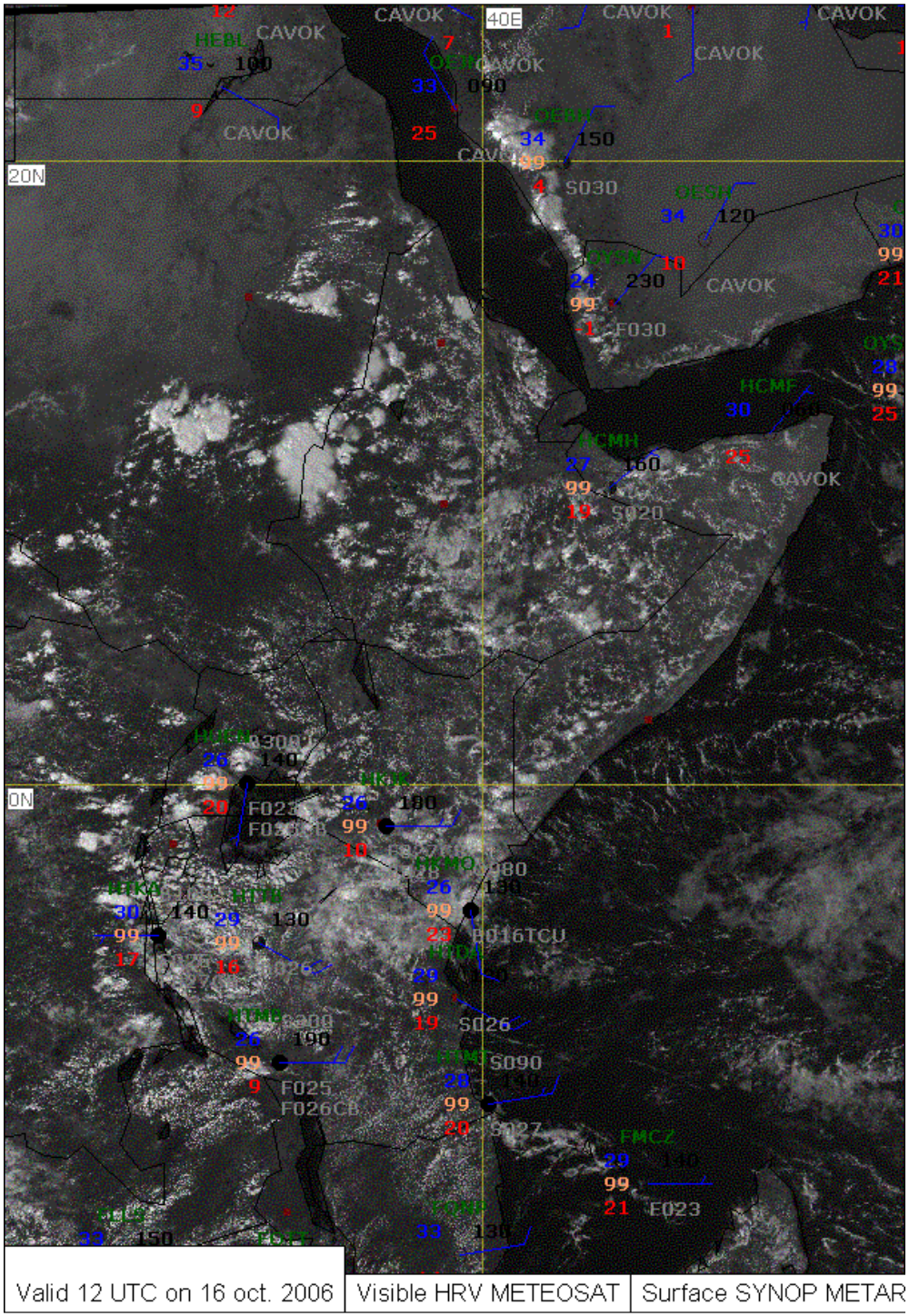
- Most NWP Models may have difficulty predicting due to problems with initial conditions and convective parameterisation schemes.
- Our task will be to use NWP intelligently to predict:
- Timing and location of convection initiation
- Convective system evolution

The Forecast Process

- Look for favourable synoptic and mesoscale patterns in NWP products;
- Look for favourable conditions (instability on ascents, indices) for convection formation;
- Be alert for any known model biases in positioning/timing errors of synoptic systems;
- Watch for predictions of unrealistic looking precipitation due to convective parameterisation limitations.

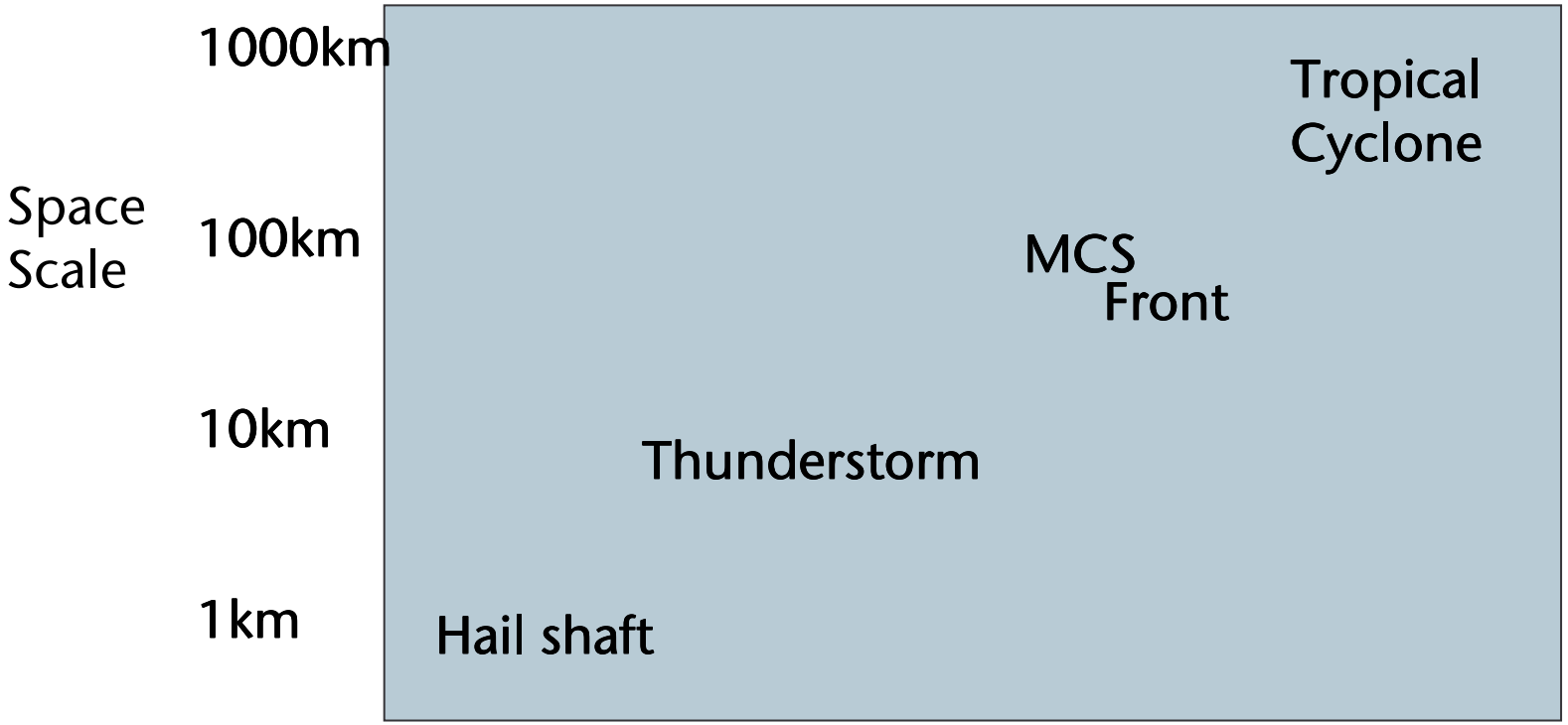
Lake/Sea Breezes

- **These are thermally-forced circulations. Their forecasting requires knowledge of the:**
  - local environment, i.e. the orography and orientation of the coast;
  - prevailing synoptic-scale weather patterns.
- **Generally favourable conditions**
  - synoptic conditions that allow strong heating of land areas;
  - the synoptic-scale flow that is relatively weak;
  - generally clear conditions that promote daytime heating and night time cooling of the land areas- a pronounced diurnal cycle in wind speed and direction.
- **Forecast hint**
  - Use model output to check low-level flow and flow aloft.


40E
20N
0N
CAVOK
HEBL
HCMF
HCMH
HTKA
HTTB
HTMB
HTMT
HTDA
HKMO
HKNW
FMCZ
FQMP
F025
F026CB
F023
F016TCU
S030
S020
S026
S090
S027
Valid 12 UTC on 16 oct. 2006
Visible HRV METEOSAT
Surface SYNOP METAR

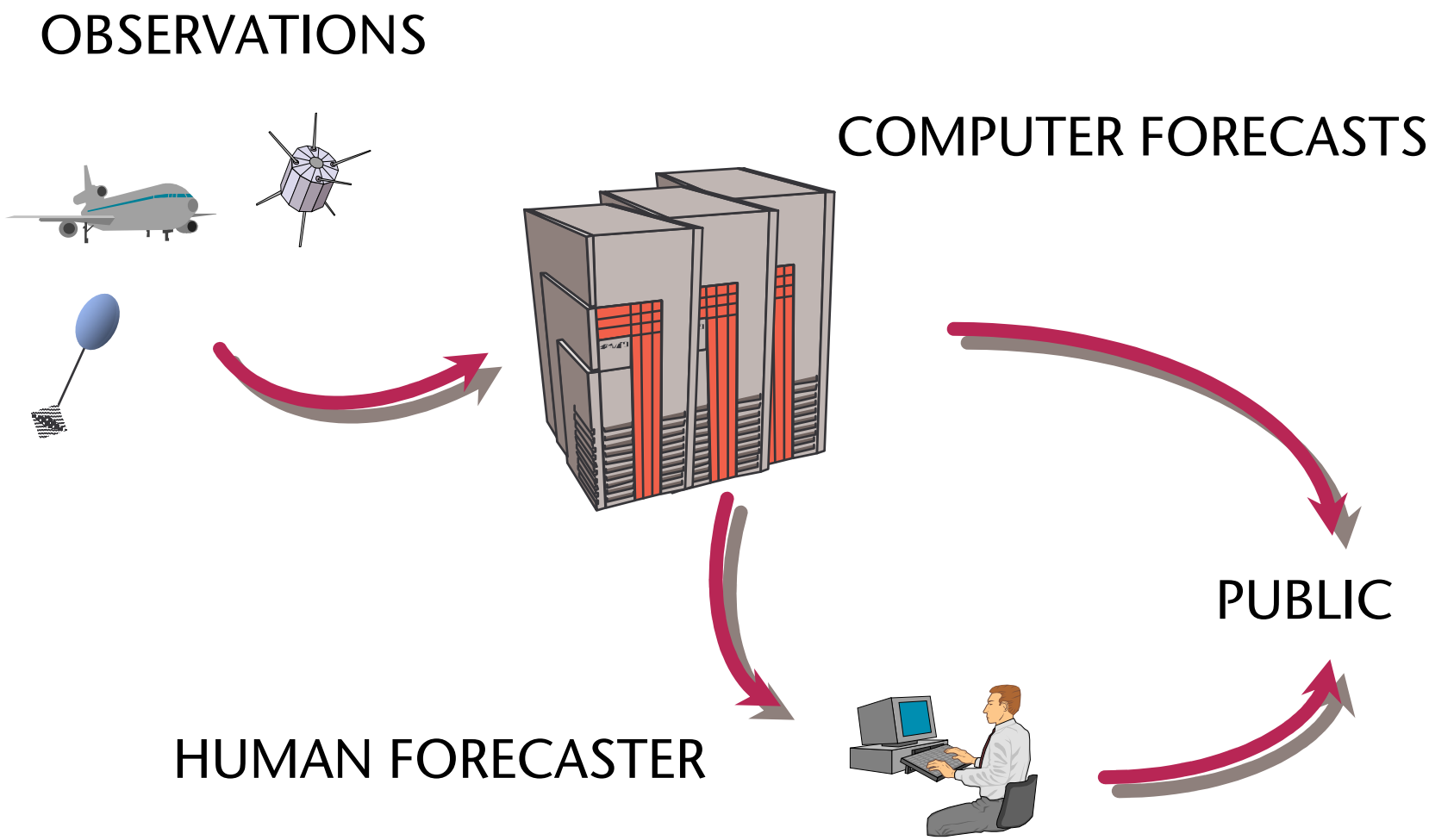
Sea Breeze

Temporal Resolution



Lifetime	10mins	1 hr	12hrs	3 days
Predictability?	30mins	3 hrs	36hrs	9 days

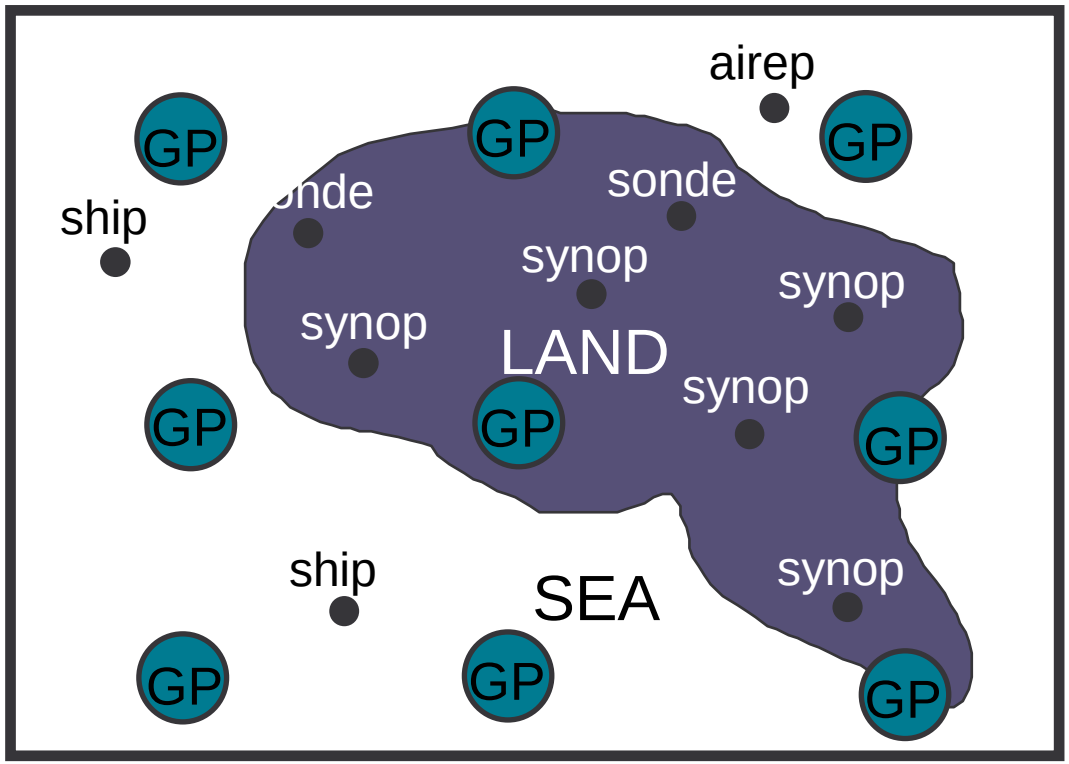
Using observational data



Using Observations

Quality control
- buddy checks
- climatology
- temporal consistency
- background field

Interpolated onto
the model grid points



Different types of data have different areas of influence

Using Observations

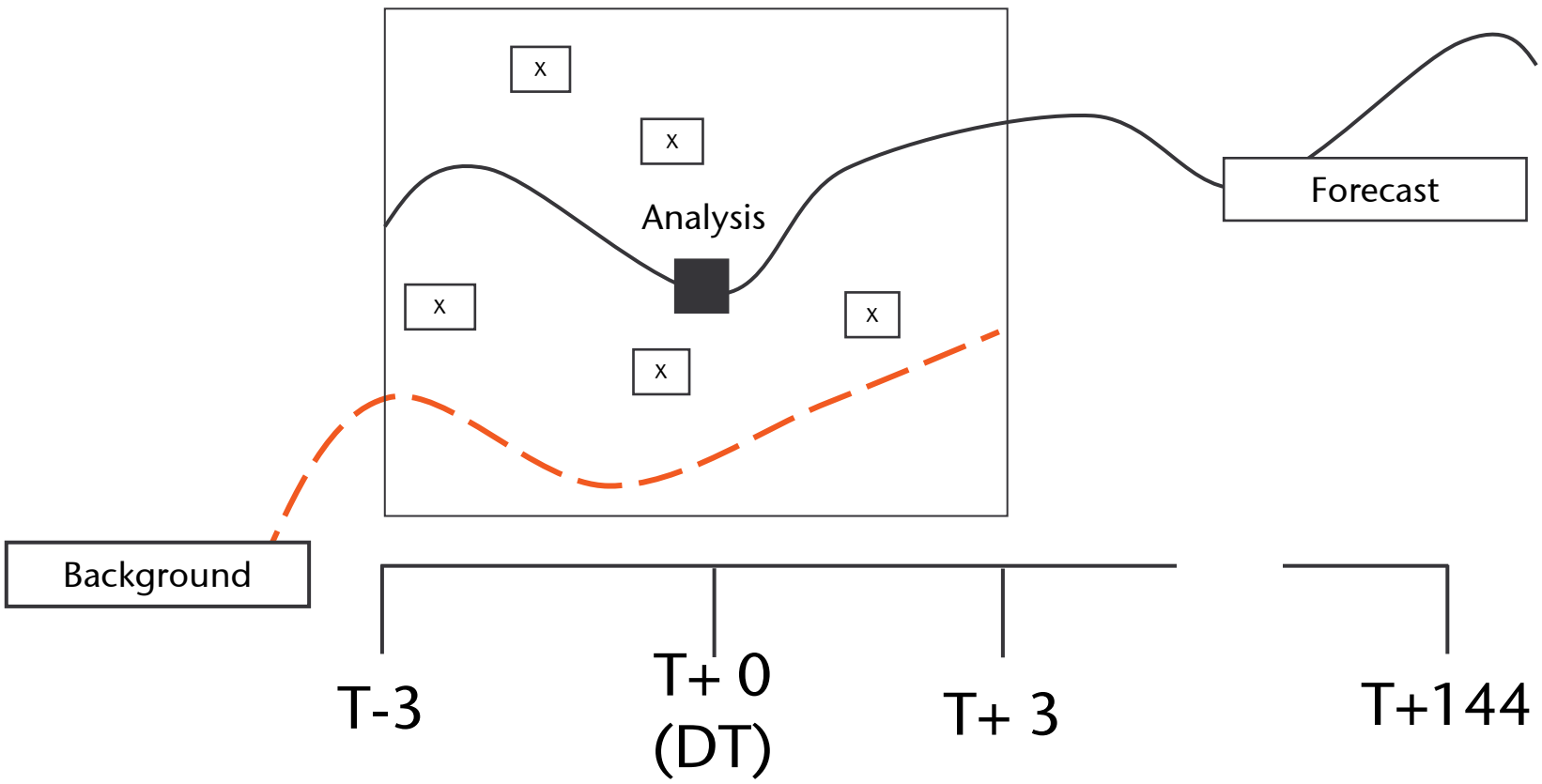
- NWP cannot rely solely on observations to produce its initial conditions
  - Why?
  - There are too few
  - Point observations may not be representative of a grid box

- A short period forecast from a previous run of the model fills the gaps
  - Model background field

Data Assimilation

- Method used to blend real and model data
- Model is run for an assimilation period prior to the forecast
- Data is inserted into the run at or near their validity time to nudge the model towards reality

4DVar - GM



Strengths of 4DVar

- Able to take advantage of non-standard ob types e.g. satellites
- Stability within model physics and ultimately, the forecast
- Better representation of small-scale, extreme features

Questions & Answers