«Meteorological data for assessing climatic loads»

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by
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WG B2.28

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TOR approval, date & original schedule

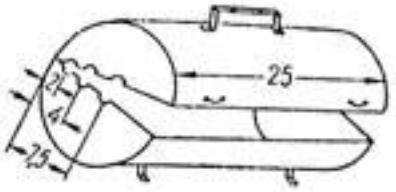
- WG title: « Meteorological data for assessing climatic loads ». TOR approved February 2010.
- Needs of Target Groups :
  - ✓Are representative climatic data available and are the weather assumptions valid?
  - ✓Update of IEC & CENELEC Standards: e.g. IEC 61774, IEC 60826, EN 50341, etc.
  - ✓How can we improve continuously the probabilistic design methods of OHL, including security, safety and continuity of service?
- Resume of the TOR:
  - ✓Turbulent wind enhancements behind steep terrain
  - ✓ Application of numerical weather prediction models
  - ✓ Measurements and observations of ice loads
- Completed 2014, revised 2015

Ch 3: Atmospheric icing

- Some text is updated from TB 291
- Updated info on icing measurements on Iceland (continously since 1972)
- *New information from Russia*
- Updates on UK measurements, including a total upgrade of Deadwater Fell test site
- Influence from topography
- Anti-icing and de-icing technologies (TB 438)
- Revised model for wet snow accretion

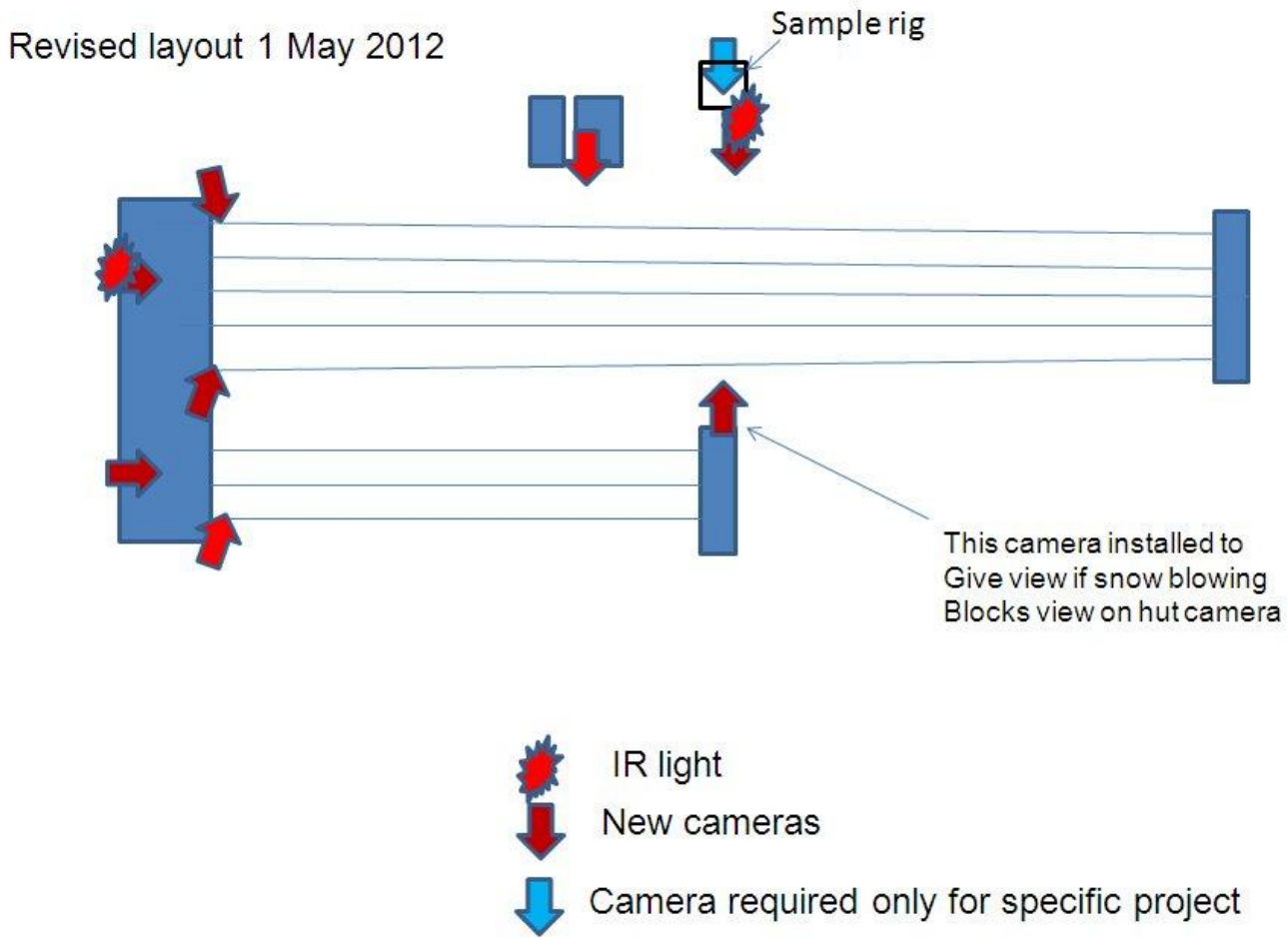
Ice measurements in Russia

Icing rack on a regular weather station

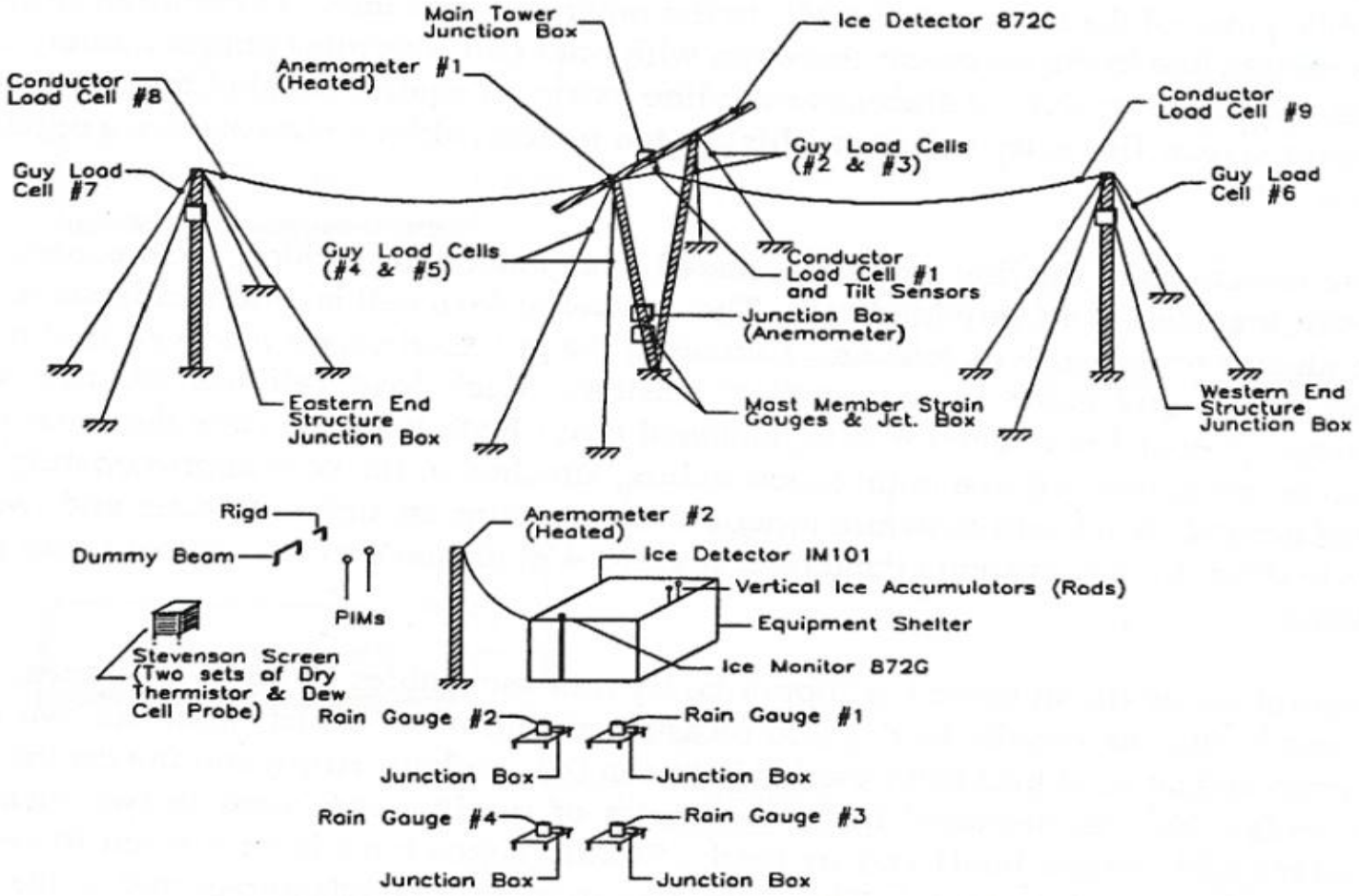


Box for collecting and melting wet snow sample

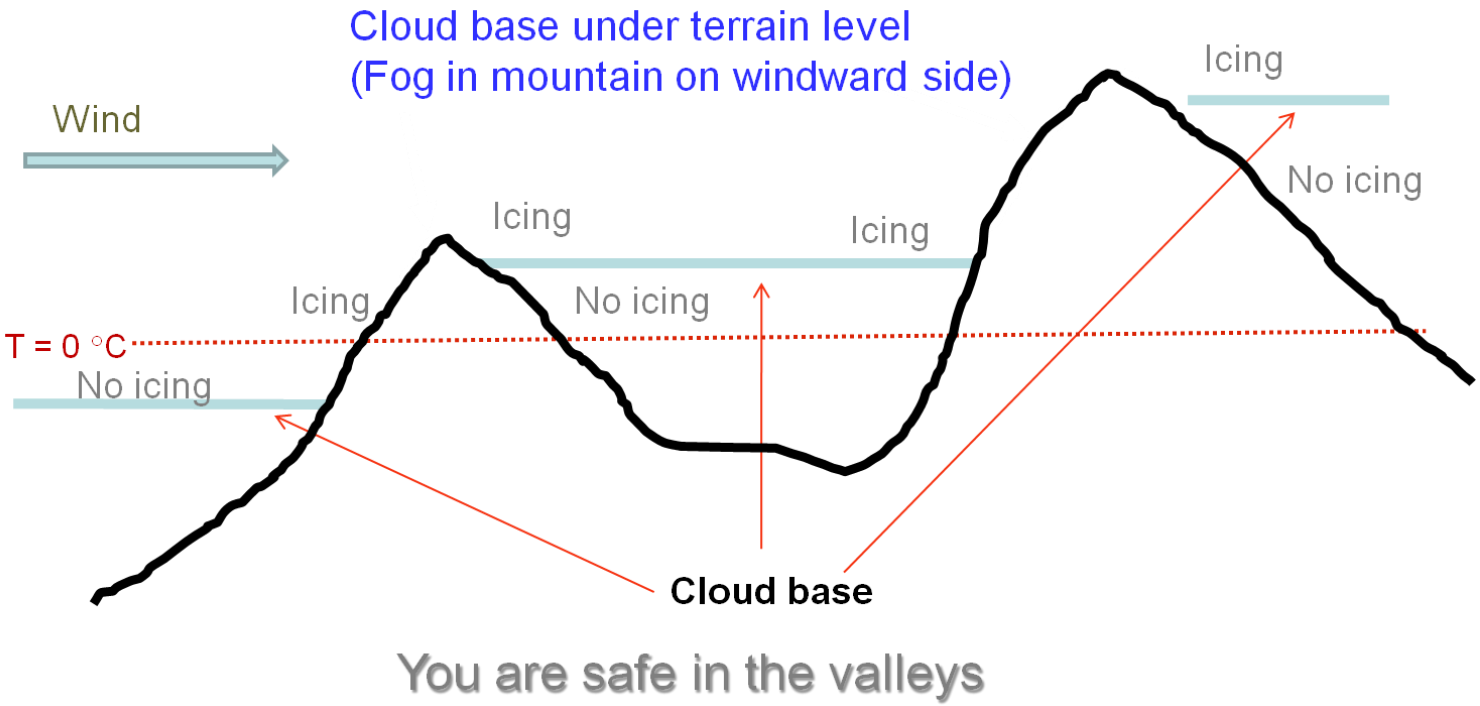
New Deadwater Fell test site



Hawke Hill test site, Newfoundland



Sheltering from upwind terrain



When approaching tops and ridges you are in danger if there is no higher mountain in the windward direction

Revised wet snow model

General accretion model: $dM/dt = \beta\ V\ w\ A$

- dM is the accumulated snow mass per unit length during the time step dt,
- β is the sticking efficiency (the fraction of snow that sticks to the cylinder after collision),
- A is the cross-sectional area of the cylinder perpendicular to the snowflake impact speed V,
- w is the mass concentration of wet snow in the air.

$$V = (U^2 + V_s^2)^{0,5}$$

U = wind speed,
V_s = terminal velocity of snow flake

Sticking efficiency (new): $\beta = 1 / U^{0,5}$

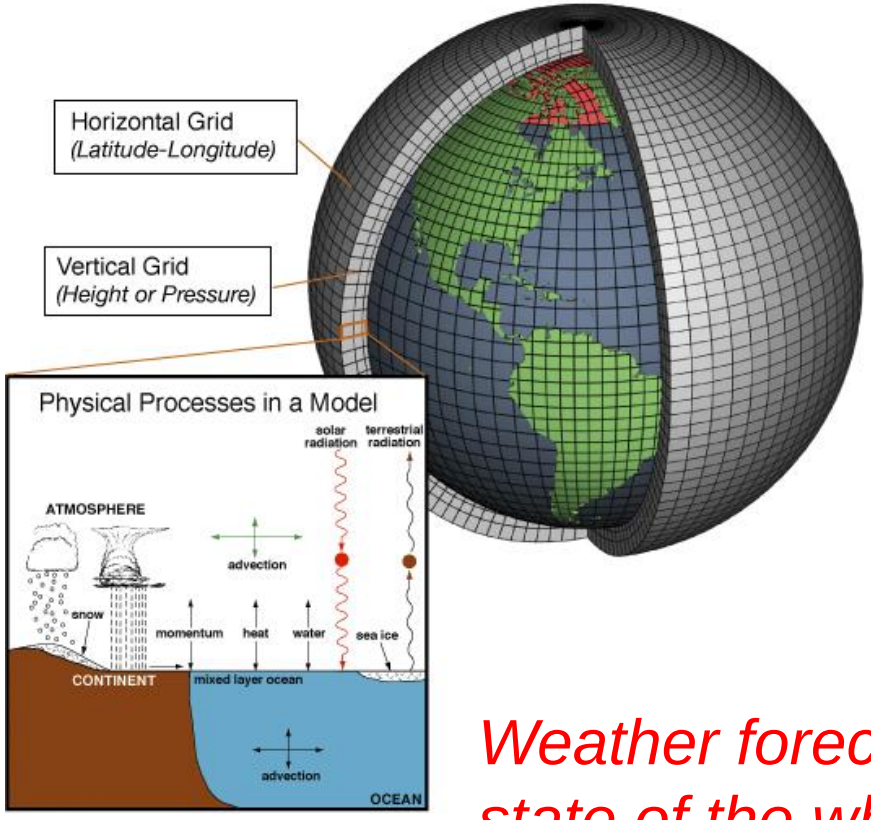
Wet snow density: $\rho = k + 20\ U$

$(\rho < 750\ kg\ m^{-3})$

Ch 4 – Wind and Ice

- The probability of high winds on an iced conductor will always depend on the length of time the ice stays on the conductors.
- Combination factors may be selected for individual countries according to separate analyses.
- Published methods for determining combining ice and wind loads are available as in EN 50341-1, CSA C22.3 or ASCE Guide 74.

Ch 5 – WRF modeling

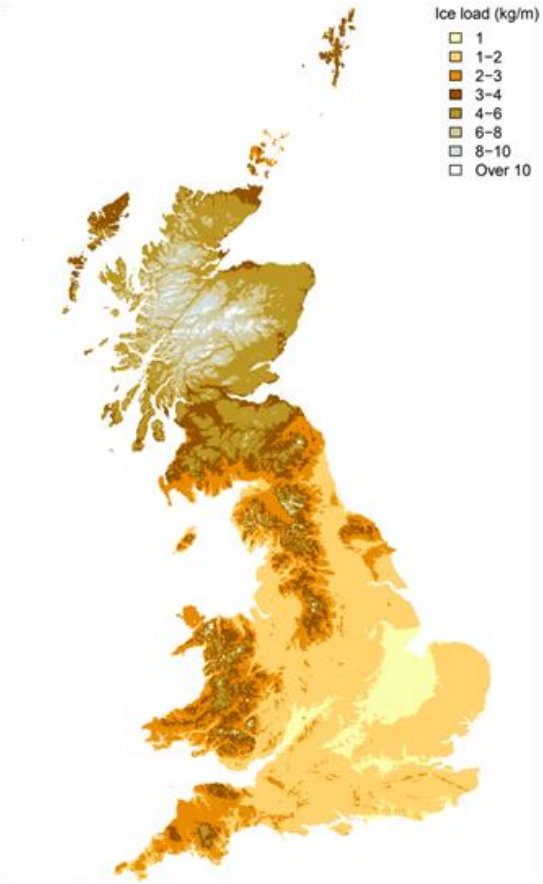


Surface weather observations are interpolated into a grid covering the Earth

Vertical measurements of the state of atmosphere are likewise gridded in layers above the surface

Weather forecasting models integrate the state of the whole atmosphere in a 3D grid

Example: UK ice load map



Next step:

Joint work
CEN TC 250
(Eurocodes)
With
CENELEC TC 11

European ice load map?

What about future climate? *Wet Coastal areas*

- As the sea temperature is also expected to rise, there may be fewer days of temperatures close to 0 °C along the coastal sides of continents, especially in northern latitudes. This means less frequency of wet snow incidents. However, higher intensity of short time wet snow precipitation may lead to higher loads when combined with low temperatures.

What about future climate? *Continental inland*

- Further inland from the coast where subfreezing temperatures are more frequent, higher wet snow loads in *absolute values* may be expected, although less *frequent* than at present. In predominant continental areas in northern latitudes the frequency and magnitude of wet snow loads are likely to *increase*.

What about future climate? *Mountains*

- In the mountain areas and continental highlands it is expected that the 0°C isotherm will be lifted on average, and hence lead to *less frequent* rime icing, at least at lower elevations. More humidity in clouds will contribute to *higher rime ice loads* whenever the conditions are favourable.

What about future climate? *Extreme values*

- It is not possible to make any sort of conclusions as to how the above arguments will influence the ice loadings with a given return period in local areas

What about future climate? *Freezing rain*

- **At this point** there is no strong indicator for significant change in either frequency or absolute load values, following from the most likely scenarios for climate change.
- This will certainly be a topic for future research


Thank you for your
attention