

Severe climatic conditions Italy - January 2017

SEERC - 3rd Technical Advisory Committee

Pargue 16th March 2017



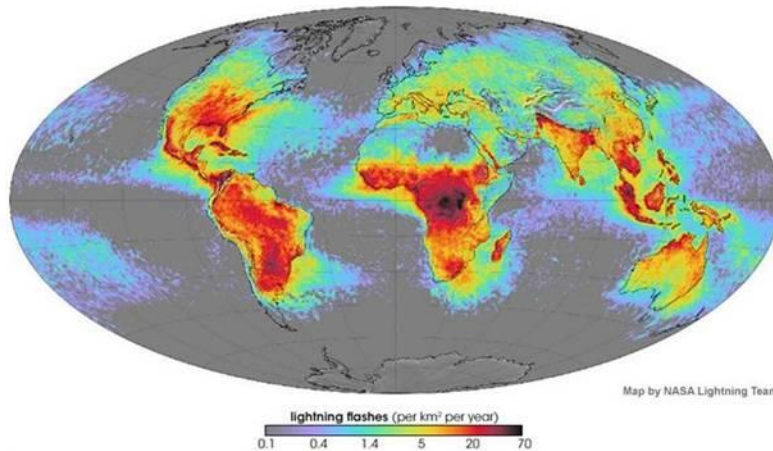
World weather changes

- High winds
- Sand storms
- Earthquakes
- Pollution
- Lightinig
- Ice/snow storms



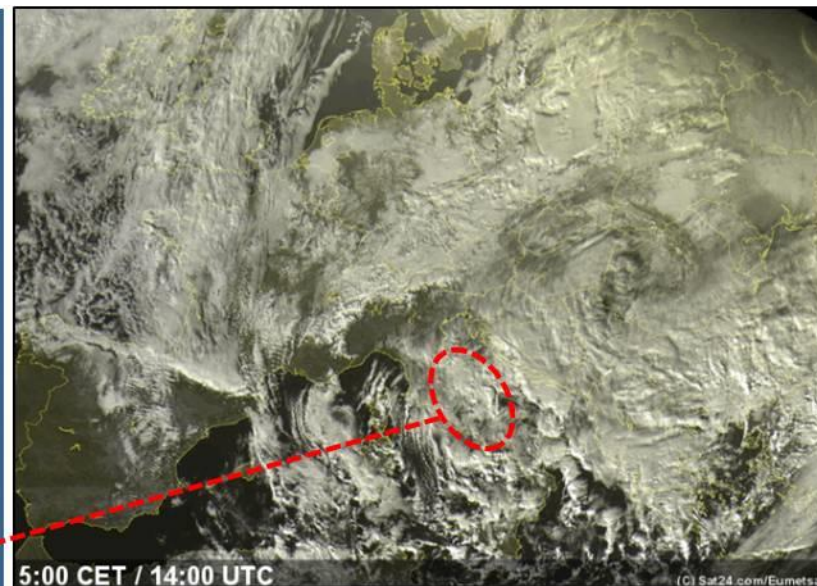
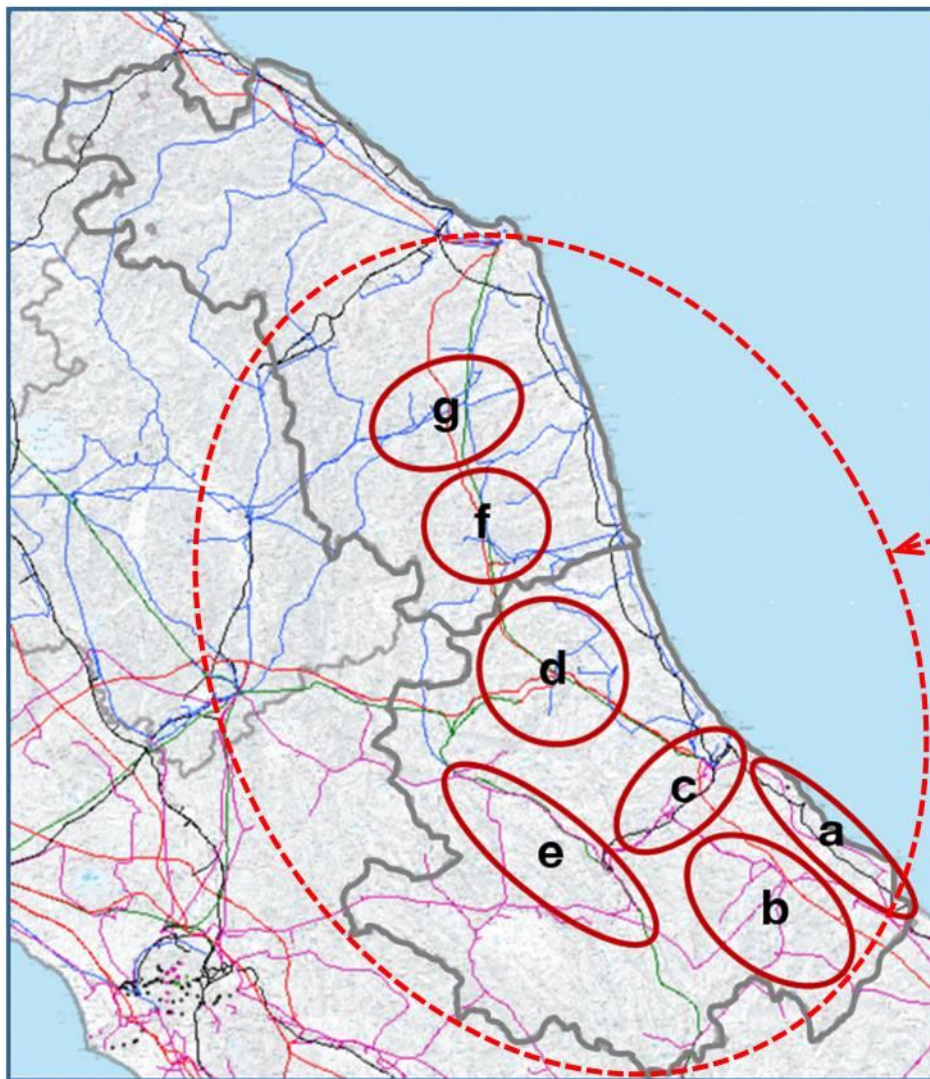
World Lightning Map

Lightning is not uniformly distributed across the Earth.





Ice/snow storms





Ice/snow storms

Ice/snow “direct” effects on OHLs





Ice/snow storms

Ice/snow “indirect” effects on OHLs





Ice/snow storms

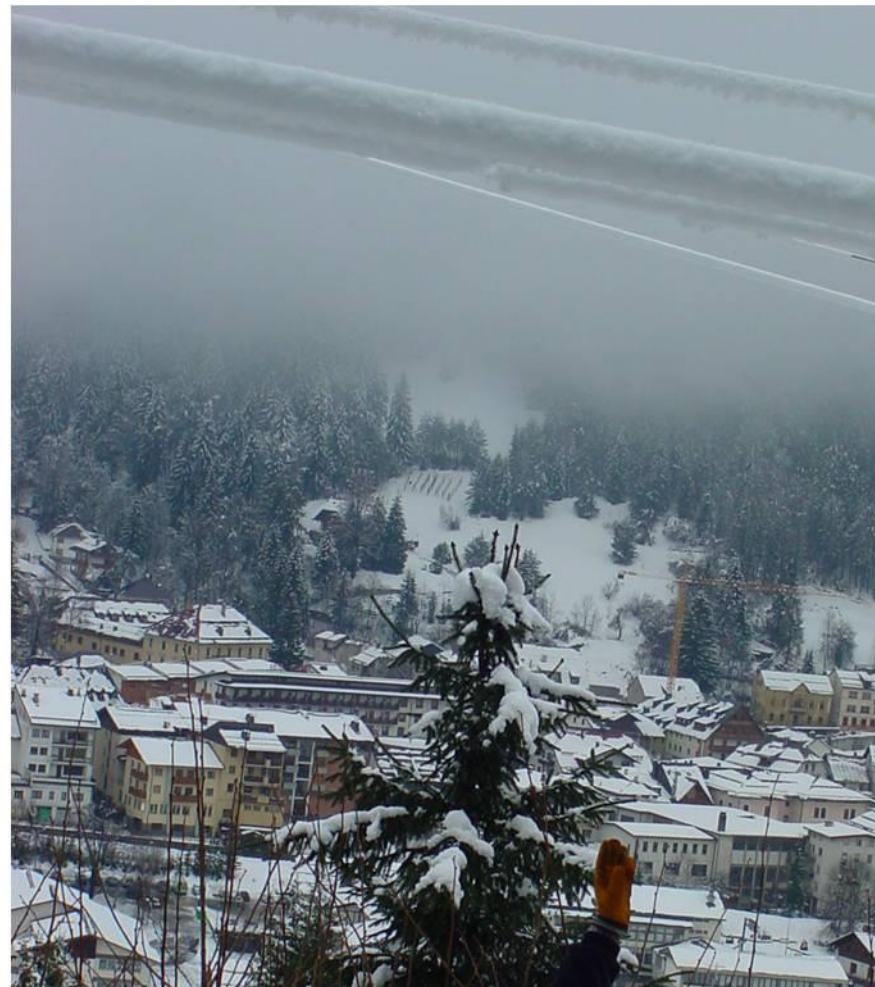
Ice/snow extra loads on conductors and ground wires





Ice/snow storms

Ice/snow extra loads on conductors and ground wires





Ice/snow models: Cigré 291

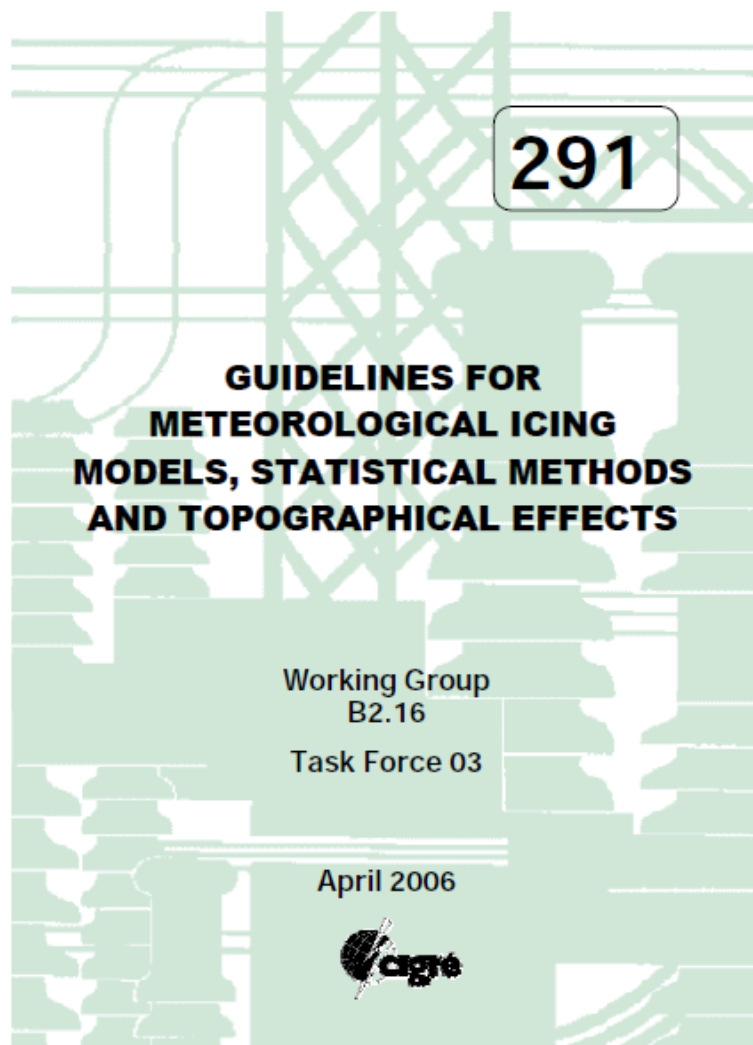


Table 1: Classification of ice types with typical density ranges – Reference [5]

Ice and snow type	Density (kg/m ³)	Description
Glaze ice	700-900	Pure solid ice, sometimes icicles underneath the wires. The density may vary with the content of air bubbles. Very strong adhesion and difficult to knock off.
Hard rime	300-700	Homogenous structure with inclusions of air bubbles. Pennant shaped against the wind on stiff objects, more or less circular on flexible cables. Strong adhesion and more or less difficult to knock off, even with a hammer.
Soft rime	150-300	Granular structure, "feather-like" or "cauliflower-like". Pennant shaped also on flexible wires. Can be removed by hand.
Wet snow	100-850	Various shapes and structures are possible, mainly dependent on wind speed and torsional stiffness of conductor. When the temperature is close to zero it may have a high content of liquid water, slide to bottom side of the object and slip off easily. If the temperature drops after the accretion, the adhesion strength may be very strong.
Dry snow	50-100	Very light pack of regular snow. Various shapes and structures are possible, very easy to remove by shaking of wires.
Hoar frost	<100	Crystal structure (needle like). Low adhesion, can be blown off.



Figure 4: Wet snow accretion on overhead conductor



Ice/snow storms + earthquakes





Risk mitigation

- Weather forecast stations
- wet snow modeling and alert system WOLF-TRASM (**W**et-snow **O**verload **aL**ert and **F**orecasting)
- anti-rotation fittings for conductors/ground wires
- composite interphase spacers
- detailed ice/snow event cartography
- idrophobic coatings
- special recovery equipment
- fiber optic passive sensors for ice/snow overload detection
- fault location sensors (digital protections)

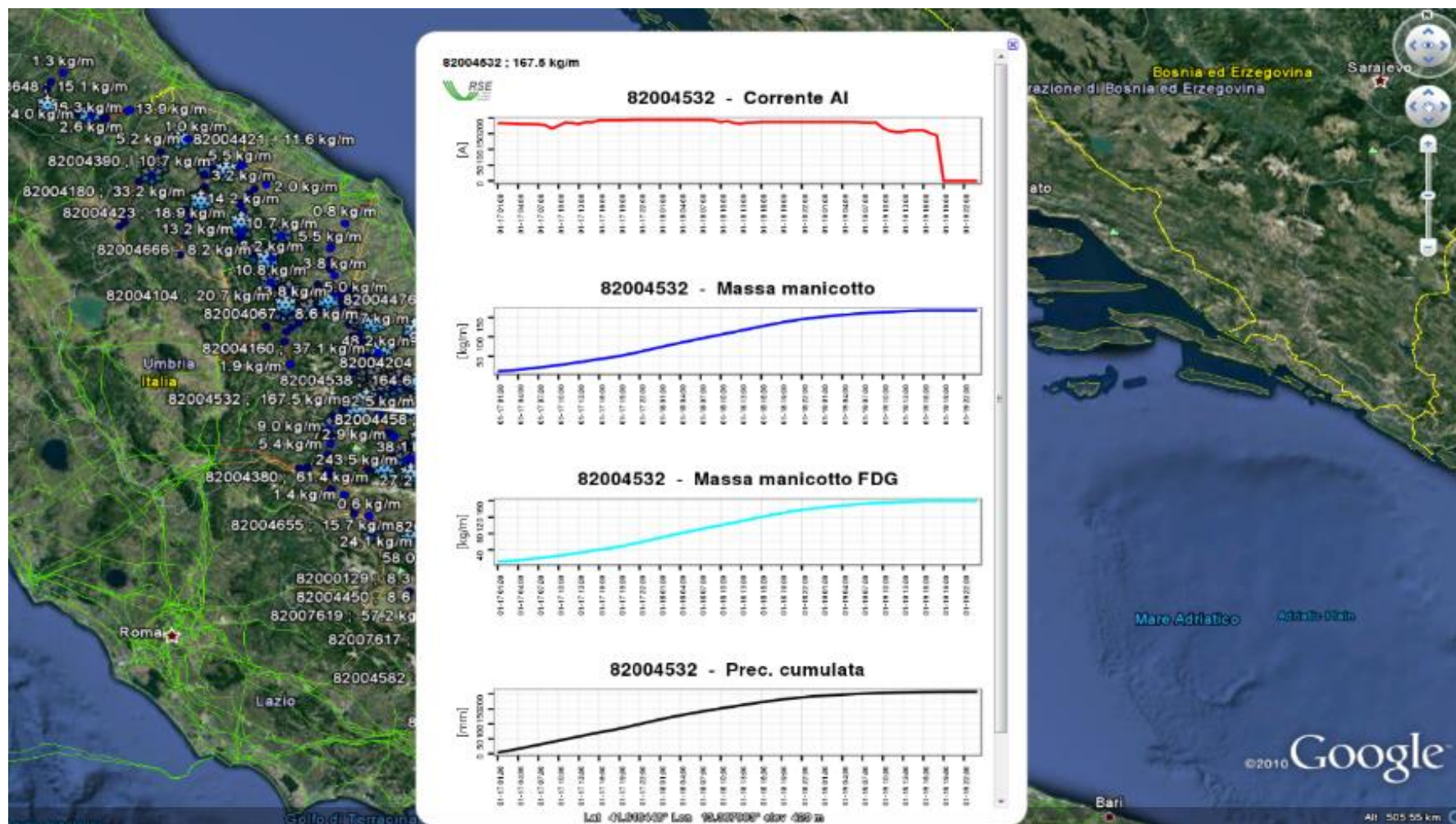


Weather forecast stations



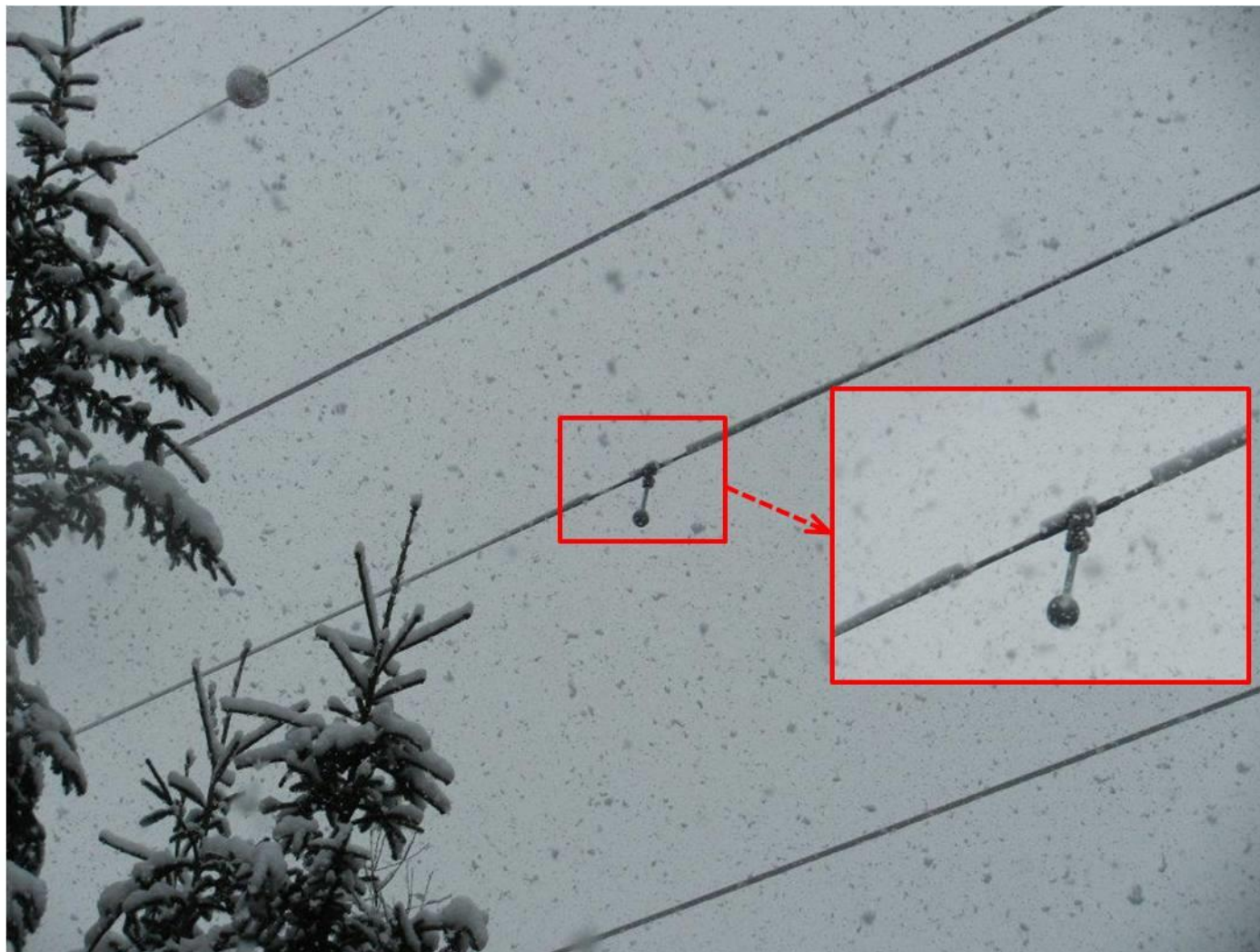
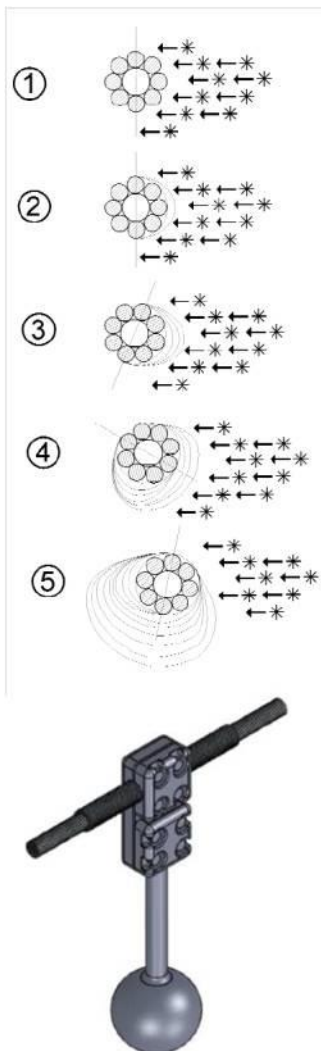


WOLF-TRASM (Wet-snow Overload aLert and Forecasting)



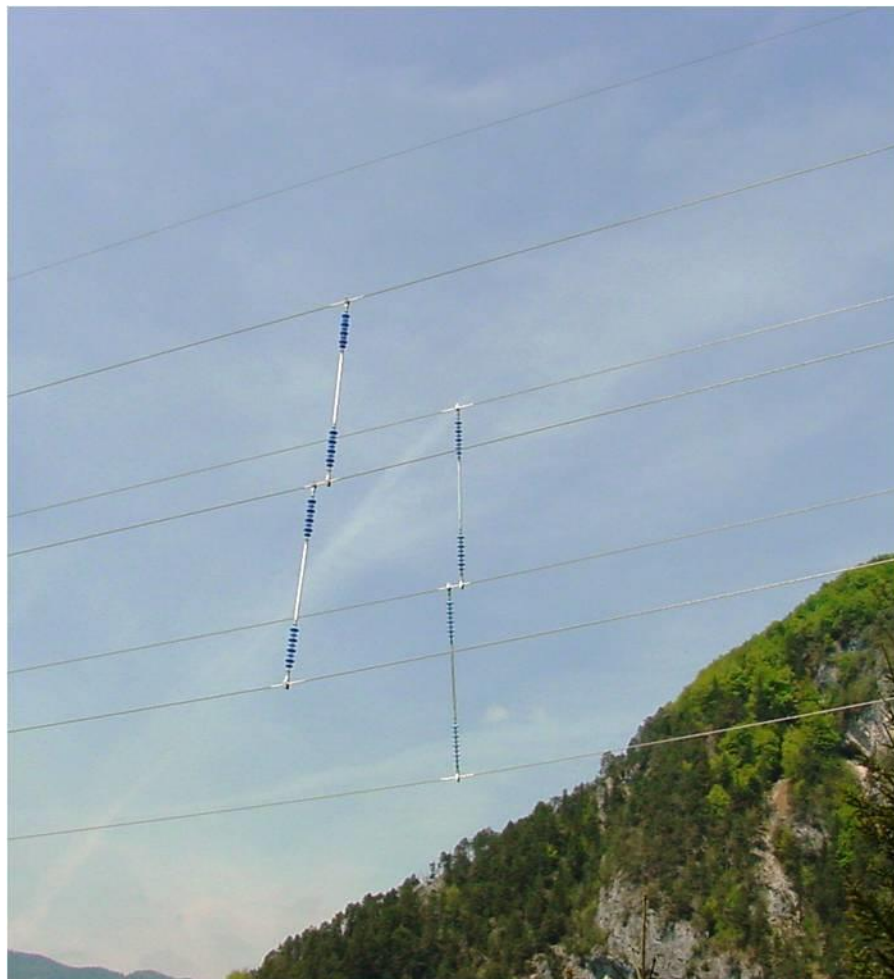


Anti-rotation fittings for conductors/ground wires





Composite interphase spacers





What happens in other SEERC Countries?



Thank you