WIND AND SNOW STORM IMPACTS ON SOCIETY

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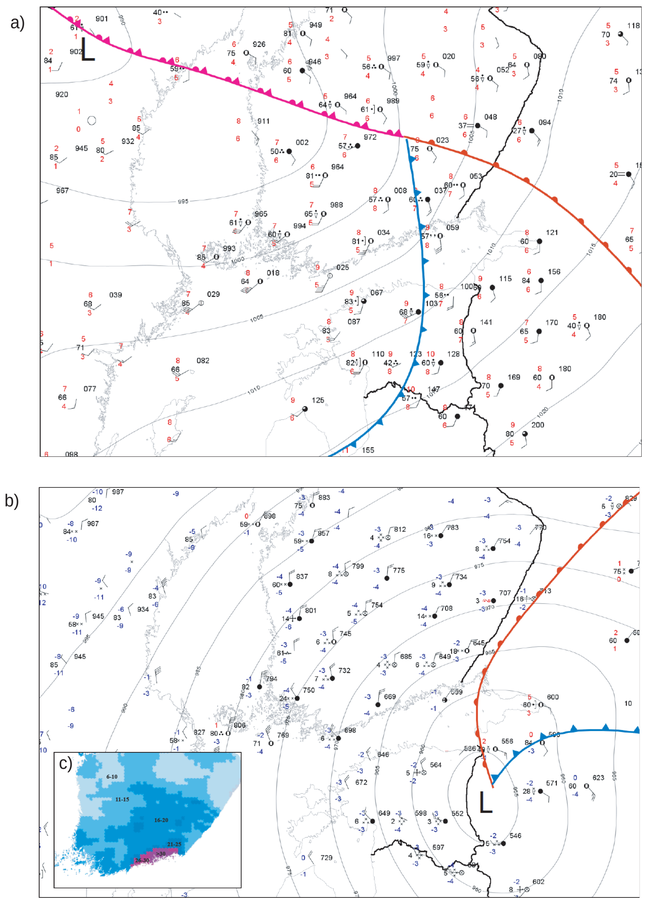
In November 2008 two damaging storms affected southern Finland. The storm on 10 November caused up to 29 m/s wind gusts over land areas. On 23 November the measured wind gusts reached 27 m/s, but it was accompanied with heavy snowfall, up to 30 cm in 24 hours. These cases offered a change to study wind storm impacts on Finnish society, but also to compare the storm impacts with and without heavy snowfall.

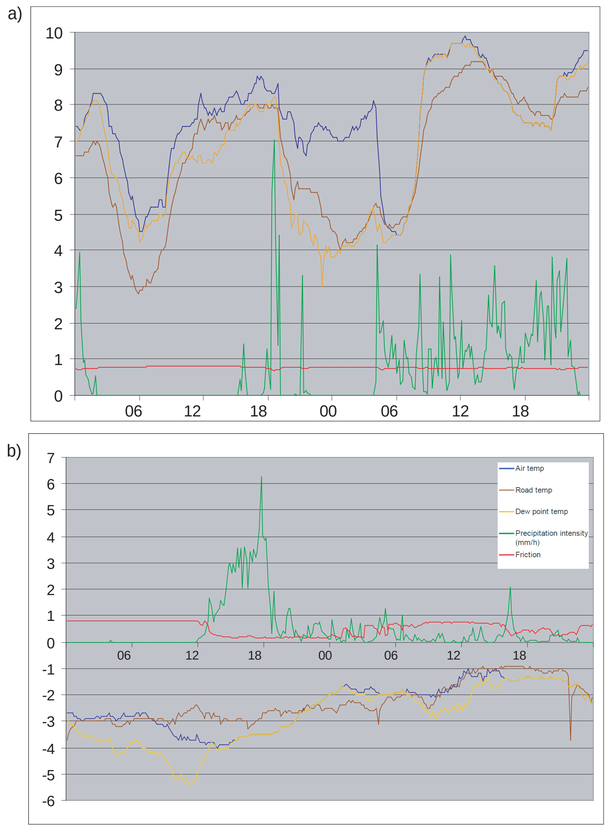


Weather situations in Finland a) 10 November at 1800 UTC, and b) 23 November at 1500 UTC. The surface isobars are from Hirlam analysis. c) Snow accumulation (cm) in southern and central Finland based on radar measurements during 23 November 0600 UTC - 24 November 2008 0500 UTC.

DATA

o Rescue Services rescue operations.
o Finnish Motor Insurers´ Centres statistics of paid compensations.
o Media reports.
o 3 second maximum wind gust of each 10 minutes from Finnish Meteorological Institutes ground observation stations.
o Road weather observations from Finnish Road Administrations Vaisala's DSC111 optical instrument.
o Damage reports from near observation stations we collected and classified based on the preceding maximum wind gust.
o Examples of damage that can occur with certain gust speeds we gathered.
o The localized call-to-action statements were formulated in co-operation with Emergency Services College.

WEATHER IMPACTS ON DRIVING CONDITIONS



Road weather observations at Palojärvi (30 km northwest from Helsinki) on a) 10-11 November and b) 23-24 November 2008. The measurements include road surface friction measurements by Vaisala's DSC111 optical instrument (Finnish Road Administration).

During the 10-11 November case all precipitation was in the liquid form. When the rainfall was moderate, there was a small decrease in the road surface friction values. Also the strong wind gusts had a negative impact on driving conditions.

On 23 November the heavy snowfall caused the friction values to drop from ca. 0.8 to 0.2 or below. The low friction values prevailed for almost 12 hours in spite of maintenance actions. In addition the visibility was very poor and also the strong wind had a negative impact on the driving conditions.

10-11 November storm

o The number of traffic accidents was close to average.
o The number of Rescue Services rescue operations was four times the normal.
o 54% of weather related rescue operations concerned falling trees on roads.
o 6 traffic accidents of a car crashing into a tree blocking the road.
o Rescue Services reported 6 injured during the event.
o Power failures to over 70 000 households.

23-24 November blizzard

o In the worst affected province (Uusimaa), on 23rd the number of traffic accidents was fourfold, on 24th more than three times the average.
o The total number of Rescue Services rescue operations was double the normal.
o 54% of weather related rescue operations concerned falling trees on roads.
o 20 traffic accidents of a car crashing into a tree blocking the road.
  o The driver did not in poor visibility and slippery road conditions see the fallen tree early enough.
  o A tree fell over a car.
o Rescue Service reported 145 traffic accidents, in which 54 injured and one died.
o Power failures to over 41 000 households.

	Wind gusts (m/s)	Heavy snow fall
15	· Some fallen trees. · Risk for humans to be hit by a falling tree.	· Tree tops or trees may bend because of snow load. · Cars stuck in snowbanks, accidents on slippery roads. · Trains and trams delayed. · False fire alarms if blizzard snow reaches fire detectors.
17	· Trees fall down over roads. Also electric power lines, telephone lines and street lighting poles may fall down and cause danger, especially for road traffic. Trees can fall over cars[1]. Cars and humans possibly stranded between fallen trees. · Damage to mobile phone base stations may worsen the network. · Boats may come loose from mooring. · Some partly detached tin roofs. Trees fall over buildings. Banners and tarpaulins[1] on building facades and roofs may be detached. Building materials blow away from construction sites[1].	· In road traffic a large risk for collisions with objects on roads because of poor visibility and slippery roads.
20	· A lot of fallen trees. · Long lasting power failures cause problems such as people trapped in elevators, public facilities loose light, mobile phone network outages. · Whole tin roofs may be detached, felt and tile roofs may become partly detached. Advertising signs on building roofs in danger to fall down. Wind can shift lightweight outbuildings. Flagpole may fall over. · Piled shipping containers may fall down. Road signboards may break off.	· Delays in air traffic, some flights transferred to other airports. · Wind gusts may push cars off the slippery roads[2].
25	· Scaffoldings may collapse. · A lot of damaged roofs, also chimneys. Building windows may brake. Balcony glazing may become detached. · Airdomes may collapse or roof structure be damaged.	
28	· Lightweight outbuildings can be relocated. · Wide and long lasting power failures possible.	

Wind storm and blizzard impact damage chart.

PREPAREDNESS FOR FUTURE STORMS

Understanding the consequences of severe weather on society helps develop preparedness for such events in the future. Knowledge on typical impacts of events can guide the formulation of several preparedness measures that aim to prevent casualties:
o General guidance for authorities and the public.
o Call-to-action statements.
o Site-specific action plans for people, private and public properties, and outdoor venues.
The impact information can also be used to mitigate property damage and ensure society's faster recovery by planning ahead, when severe weather is forecasted.

The impacts of certain severe weather on society, does not only depend on the intensity of the phenomena, but also on local effects like topography, vegetation, construction standards and local human behaviour. Therefore, the local effects should be considered when defining the typical impacts or safety rules for a certain area.

Wind storm	
General	Move indoors. Look out for falling trees and power lines.
Extremely dangerous situation	This is a very dangerous situation. Move immediately indoors away from windows. Look out for falling trees and power lines.
Blizzard	
General	Avoid unnecessary travelling. Look out for falling trees and power lines. Blizzard can cause very poor visibility.
Extremely dangerous situation	This is a very dangerous situation. Do not travel if it is not necessary. Look out for falling trees and power lines. Poor visibility makes it difficult to see barriers on roads and slipperiness increases the stopping distance.

Wind storm and blizzard call-to-action statements for Finland.

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