

# "GIS-based tool to support civil aviation management during explosive volcanic eruptions"



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## OBJECTIVES

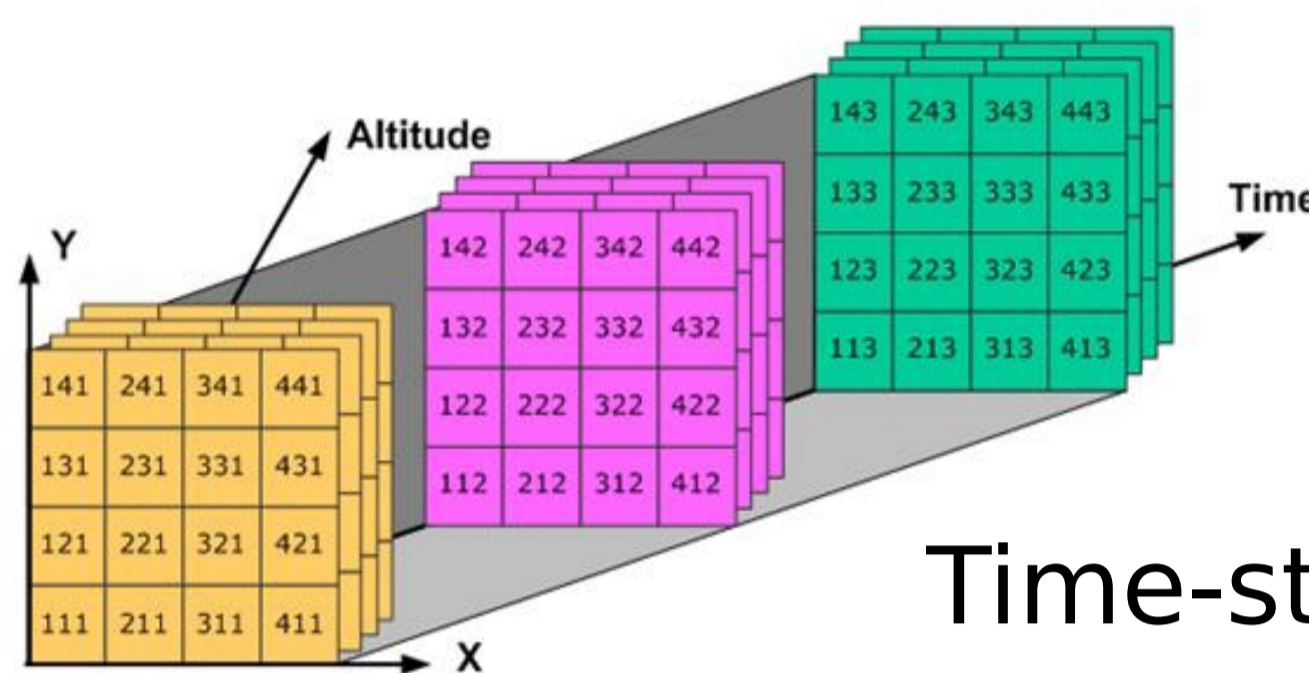
Create a **link** between ash dispersal modeling and civil aviation management  
 Estimate expected impacts of ash dispersal on civil aviation

## ASH DISPERSAL MAPS

Eyjafjallajokull 2010 - well constrained Eruptive Source Parameters (Bonadonna et al, 2010)  
 Fall3d TTDM (Costa et al., 2006) - Modeling results (Folch et al., 2010)



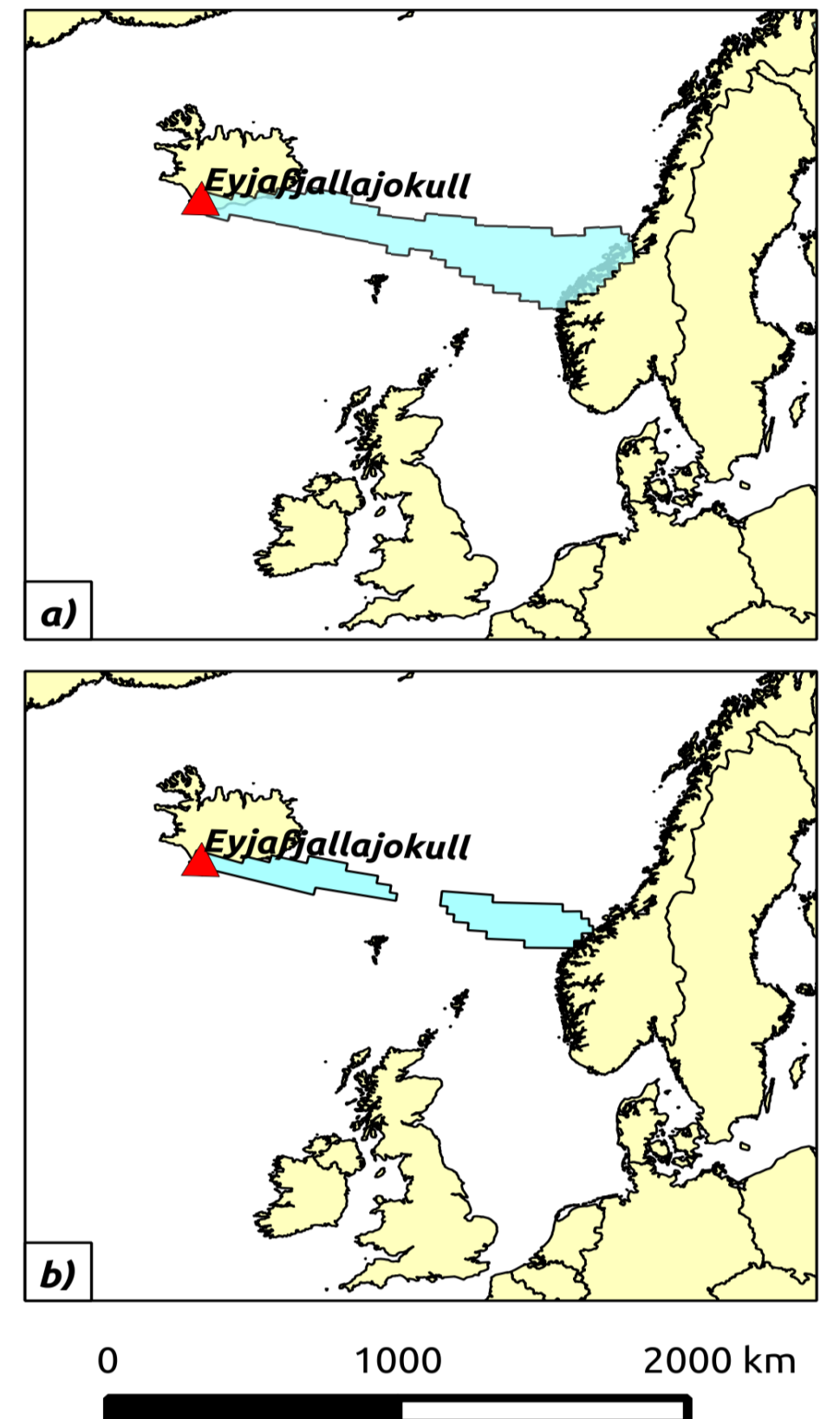
Importance of graphical format (IVATF, Bonadonna et al., 2010; Bolić and Sivčev, 2012)



Time-step = 1 hour

15 April 2010 - 22.00 UTC

- ▲ Eyjafjallajokull
  - Ash concentration at FL150
- Ash concentration threshold:  
 a) zero tolerance ( $2 \cdot 10^{-5}$  mg/m<sup>3</sup>)  
 b) 0.2 mg/m<sup>3</sup>



## GIS-BASED AUTOMATED POST-PROCESSING

## IMPACT ASSESSMENT

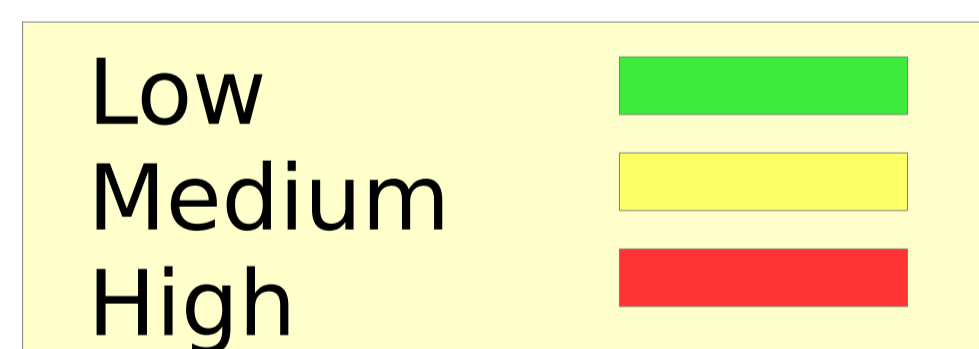
### ASSUMPTIONS

Critical ash concentration:  
 $2 \cdot 10^{-6}$  ( $\sim 0$ ), 0.2, 2 mg/m<sup>3</sup>

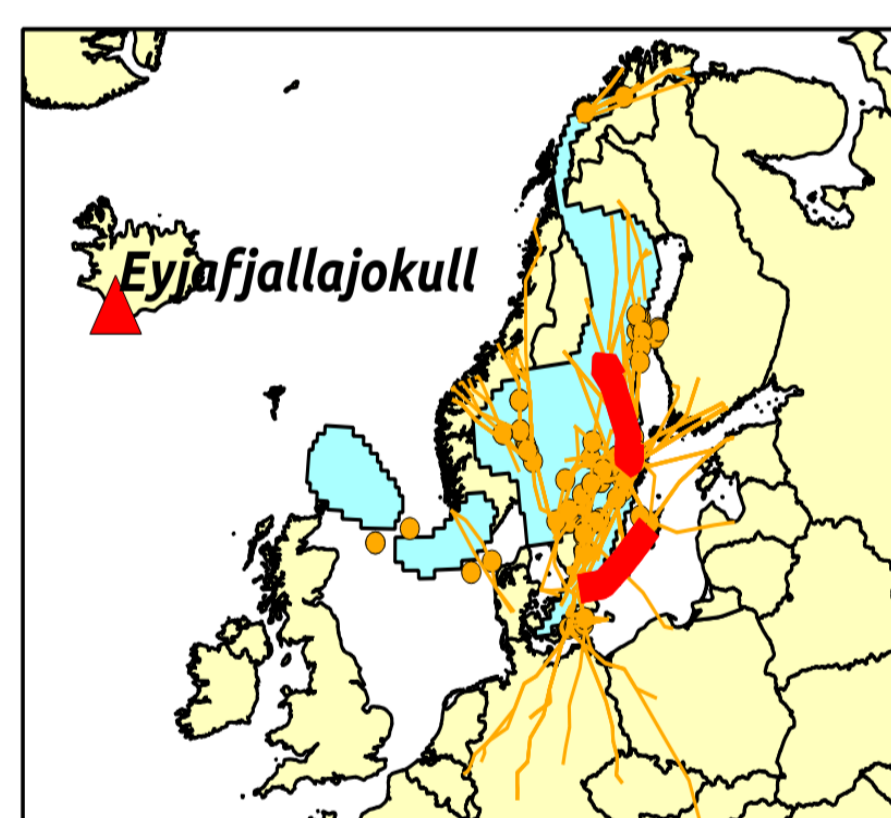
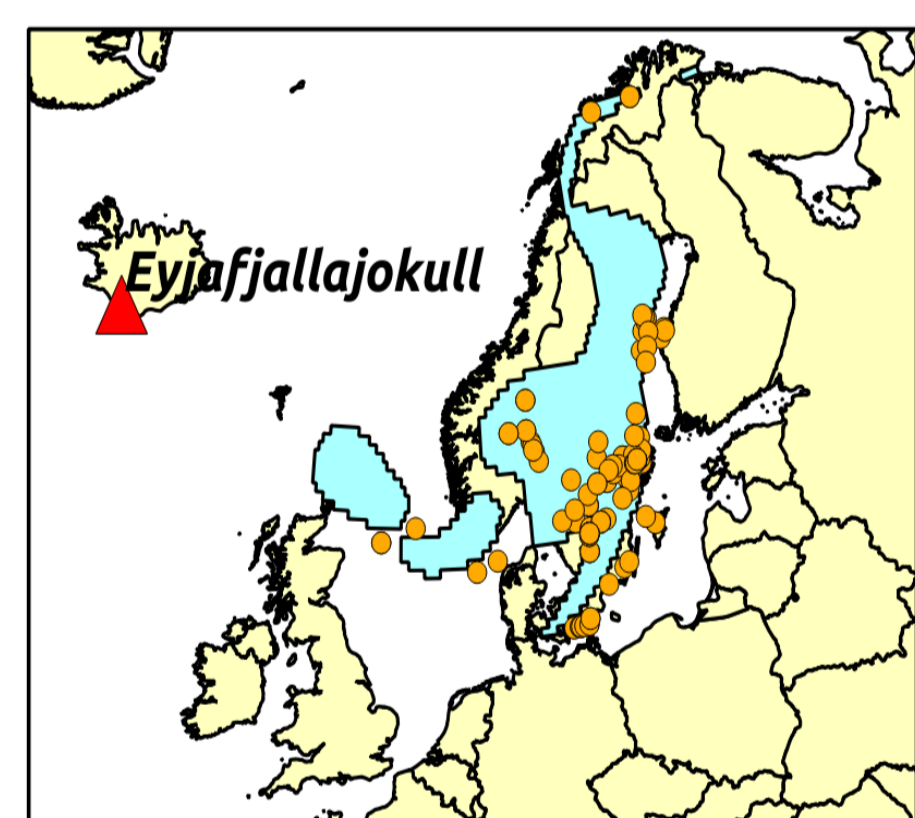
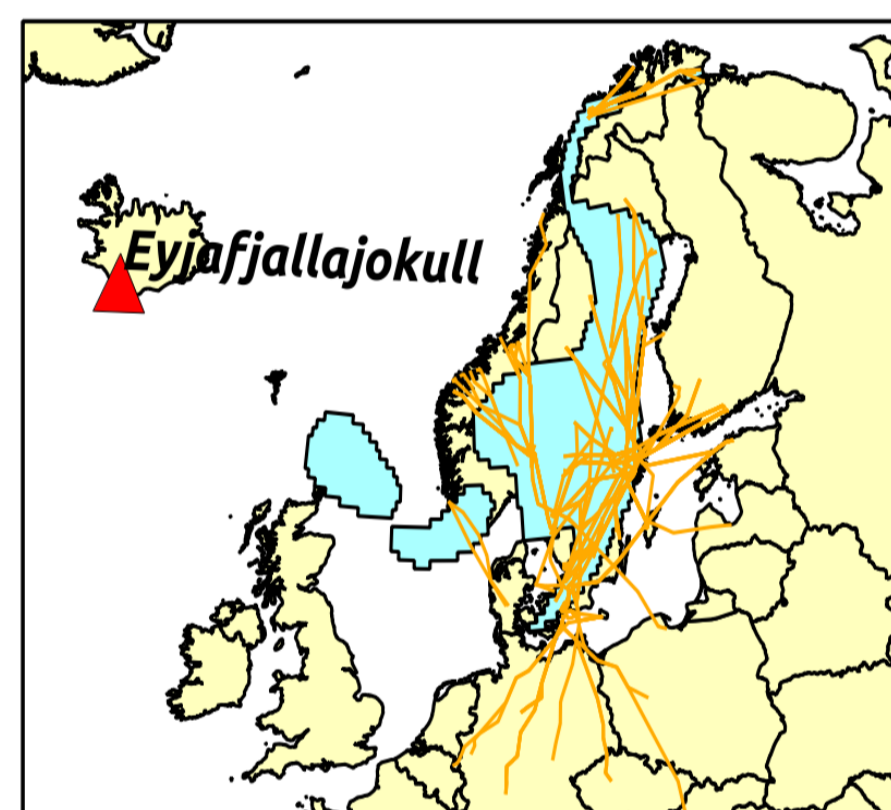
GIS-based overlap at Flight Level (FL), time and ash concentration

Airports: FL050  
 Routes: FL 150 to 350

Impact assessment based on disrupted length (qualitative)



### METHODOLOGY

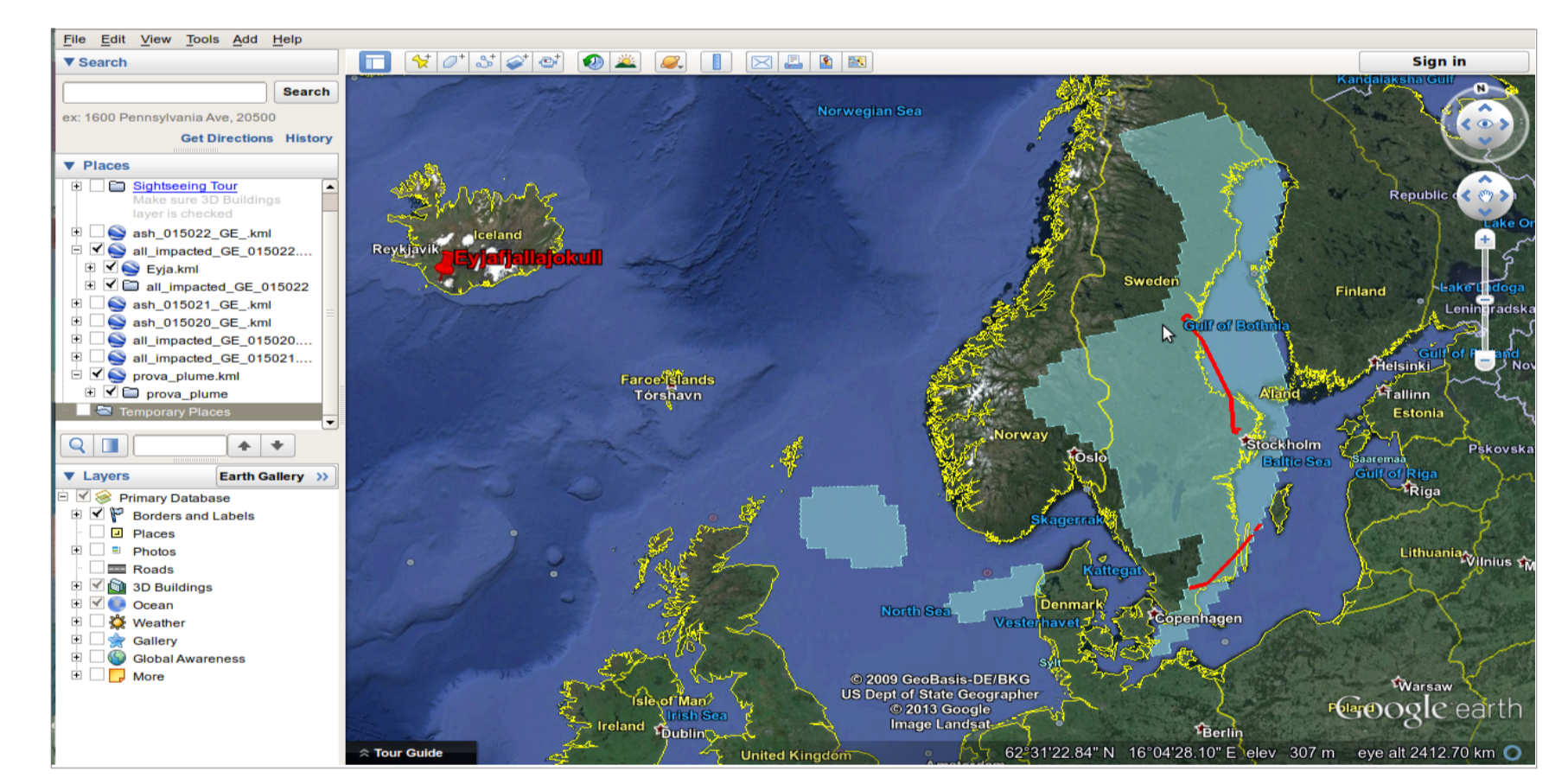
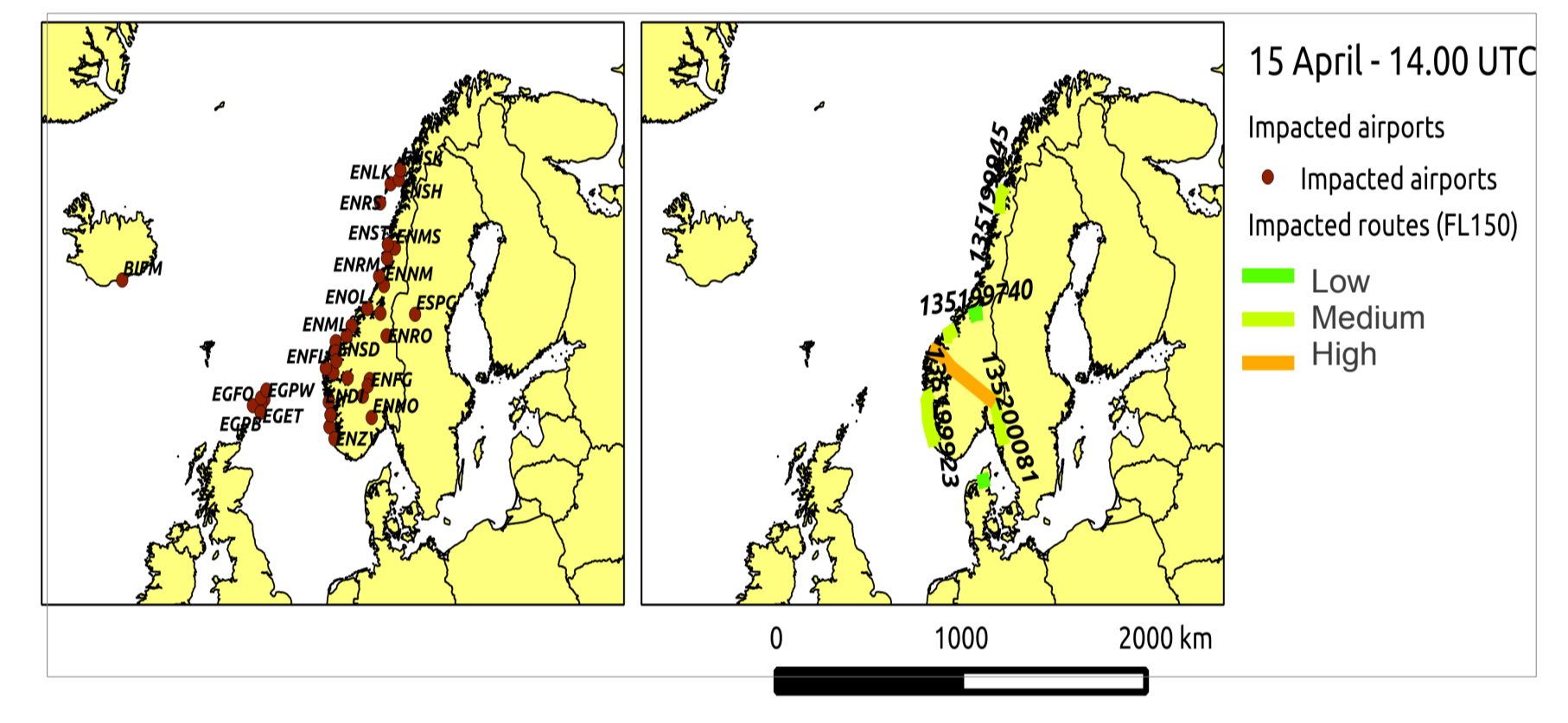


15 April - 22.00 UTC - FL150

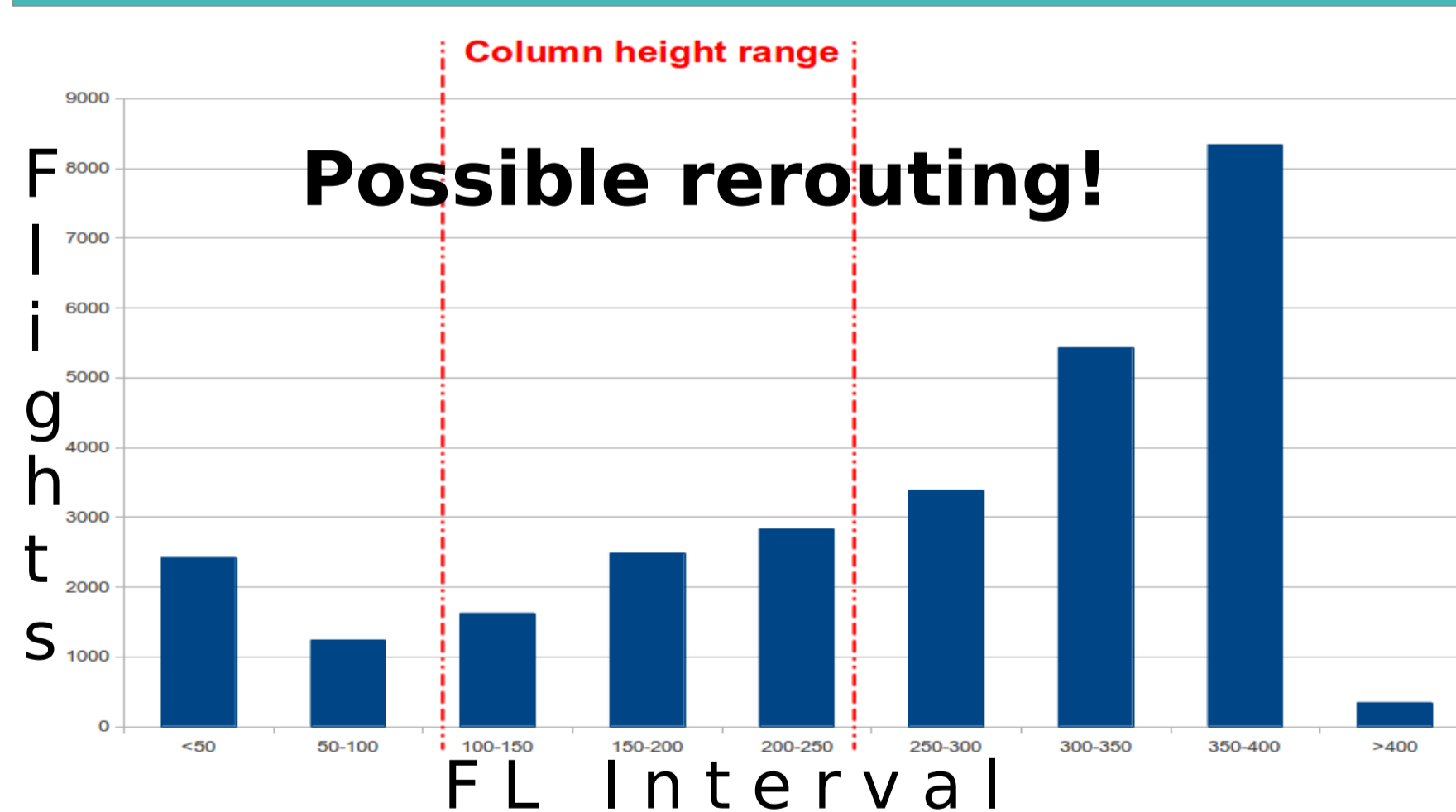
- ▲ Eyjafjallajokull volcano
- Ash concentration map
- Critical threshold:  $2 \cdot 10^{-5}$  mg/m<sup>3</sup>
- routes that intersect ash plume
- Waypoints in the time interval
- Routes impacted

Hourly tables, time series, maps

### OUTPUT



## DISCUSSION



LIMITATIONS	ADVANTAGES	IMPROVEMENTS
Strong assumptions	Link science and management	Economic aspect
Not operational	Synthesis	Become operational
Uncertainties	Hourly analysis	Probabilistic forecast
	Model-independent	Satellite retrievals

**APPLICATIONS**  
 Past eruptions  
 Training  
 Impact assessment  
 SRA (Safety risk assessment)

## CONCLUSIONS

GIS-based tool **links** tephra dispersal modeling and air traffic management  
**Simplified but multidisciplinary** approach can support decision-making  
**Complementary** with long-term hazard and impact assessment (Poster 30)

### Acknowledgements

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### References

Costa et al., 2006, "A three-dimensional Eulerian model for transport and deposition of volcanic ashes"; Foch et al., 2010, "Validation of the FALL3D ash dispersion model using observations of the 2010 Eyjafjallajokull volcanic ash clouds"; Bonadonna et al, 2010, "Future developments in modeling and monitoring of volcanic ash clouds: outcomes from the first IAVCEI-WMO workshop on Ash Dispersal Forecast and Civil Aviation"; Bolic and Sivcev, 2012, "Air Traffic Management in Volcanic Ash Events in Europe: A Year After Eyjafjallajokull Eruption in Iceland".