



*client*

University of Malta

*job*

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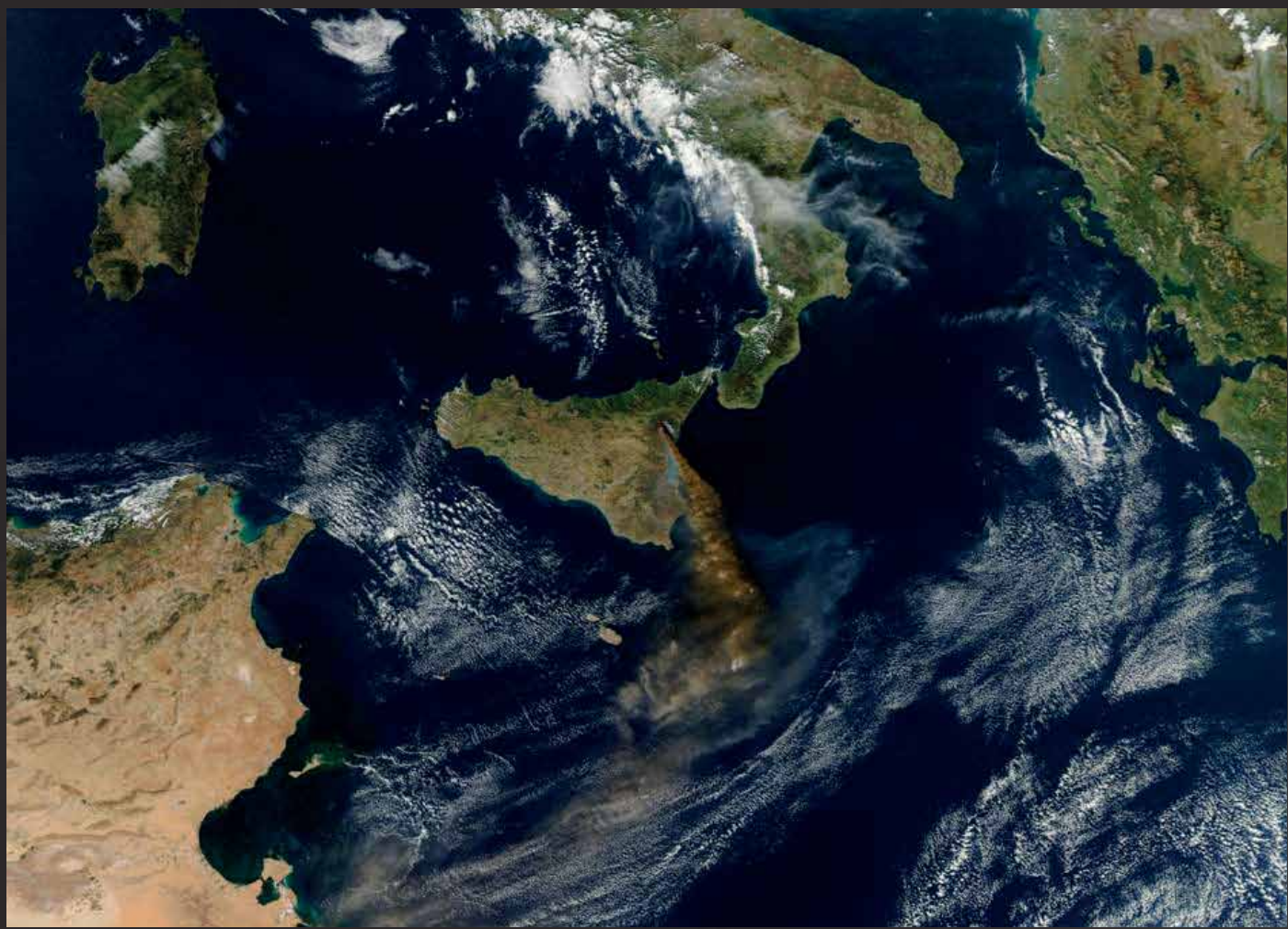


Figure 1 Satellite image of Etna's eruption October 2002 (courtesy of NASA)



Figure 2 A bar owner sweeping up ash from Etna eruption outside his establishment in Malta on Sunday 27th October, 2002 (Times of Malta, 28th October 2002).

Year	Date
1329	28th June
1694	December - March
1787	18th July
1863	7th July
1886	19th May – 7th June
1892	9th July – 29th December
2001	9th - 24th July
2002 - 2003	27th October - 28th January

Table 1 Etna eruptions which were reported to have deposited volcanic ash on Malta

Does Etna have an effect on Malta?

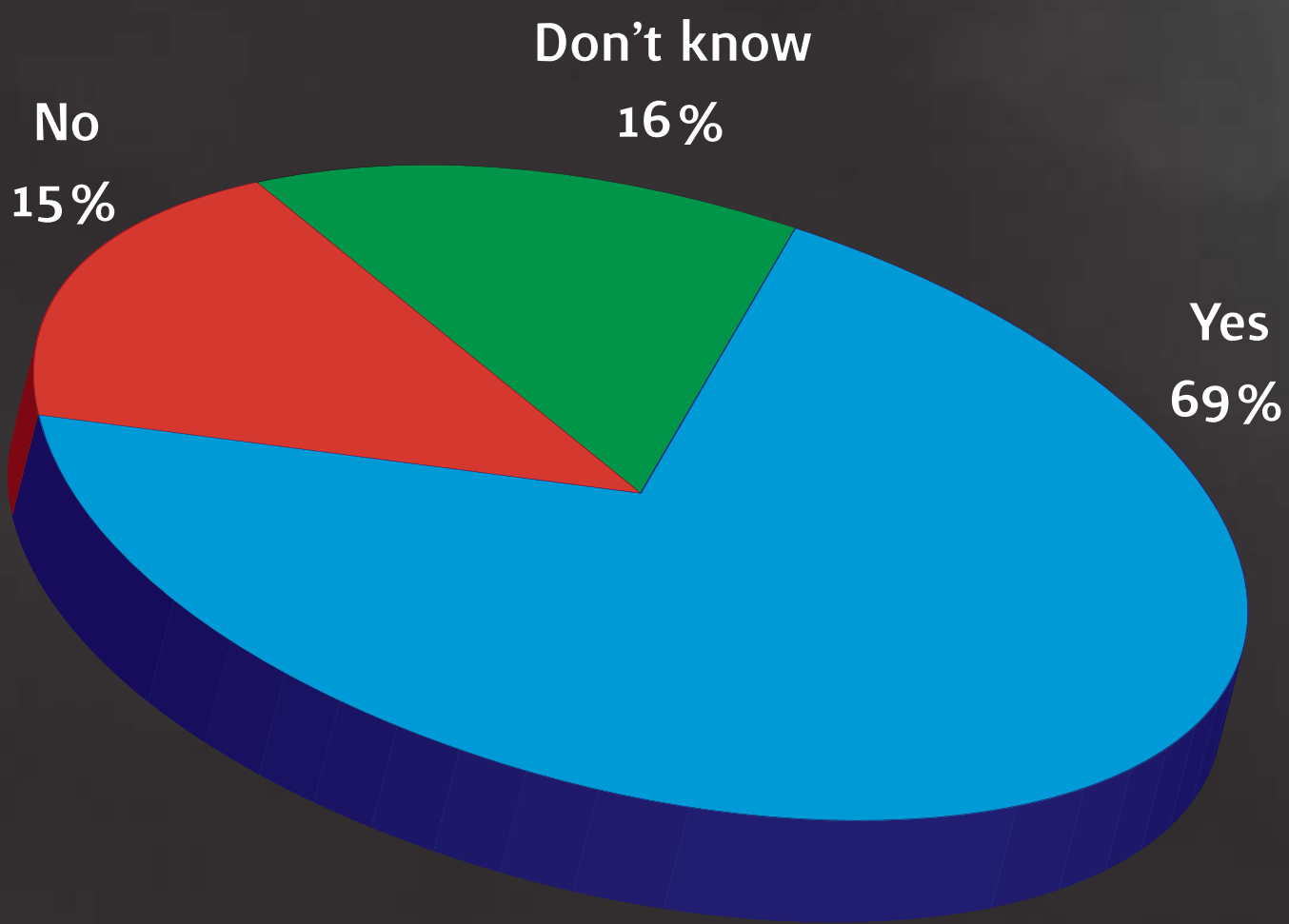


Figure 3 Pie-chart showing results of one of the survey questions

# The Effect of Etna Volcanic Ash Plumes on the Maltese Islands

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## Introduction

Research was carried out to gather information about Etna's eruptions which involved the Maltese Islands, starting with historical eruptions dating back to the 14th century to more recent ones (Table 1)(Figure 1, 2, 3). A survey was also conducted amongst University of Malta students in order to better understand the perception of the local population on the effects of Etna's volcanic activities on Malta (Figure 3).

## Methodology

A statistical approach was utilized to provide tephra deposit load and ash concentration using PUFF – a model which simulates the transport, dispersion and sedimentation of volcanic ash. Three different eruptive scenarios that characterize Etna's recent activity were considered (Table 2):

- S1: Violent strombolian activity with long duration (representing the 2001 eruption)
- S2: Sub-plinian activity with short duration (representing the July 1998 eruption)
- S3: Lava fountain activity with short duration (representing the recent activity in 2011-2012)

## Results

We found that the time taken for the volcanic ash plume to reach the Maltese Islands when the wind direction is toward the south-west ranges from 4 to 8 hours (Figure 4). The effect of wind speed and direction was also studied and it emerged that the probability that an Etna volcanic plume reaches Malta during an eruption is around 13% per annum. Out of these incidences, 35.6% occurred during summer, 28.2% during winter, 18.6% during autumn and 17.6% during spring (Figure 5). From the survey it emerged that there is paucity of information regarding this topic, possibly due to insufficient knowledge about volcanology on the Maltese Islands. However people are becoming more aware of the effects of volcanoes.

## Conclusion

The now calibrated model ( Figure 6) will produce daily forecasts of deposit load and cumulative area of volcanic ash dispersal ([www.ct.ingv.it/vamosseguro/Forecasting](http://www.ct.ingv.it/vamosseguro/Forecasting)). This will thus allow provision of adequate alerts to civil aviation authorities and Malta airport. This will be of direct use to local communities and aviation.

Input Parameters	S1	S2	S3
Eruption Duration (hours)	same as simulation duration	0.0833	1.5
Coloumn height (km)	4.5	11	9
Mass Eruption Rate (x10 <sup>7</sup> )(kg/s)	5.4	30	10
Total Grain-size (φ)	2	0.5	1
Standard Deviation	1.5	1.5	1.5

Table 2 Input parameter used for S1, S2, S3.

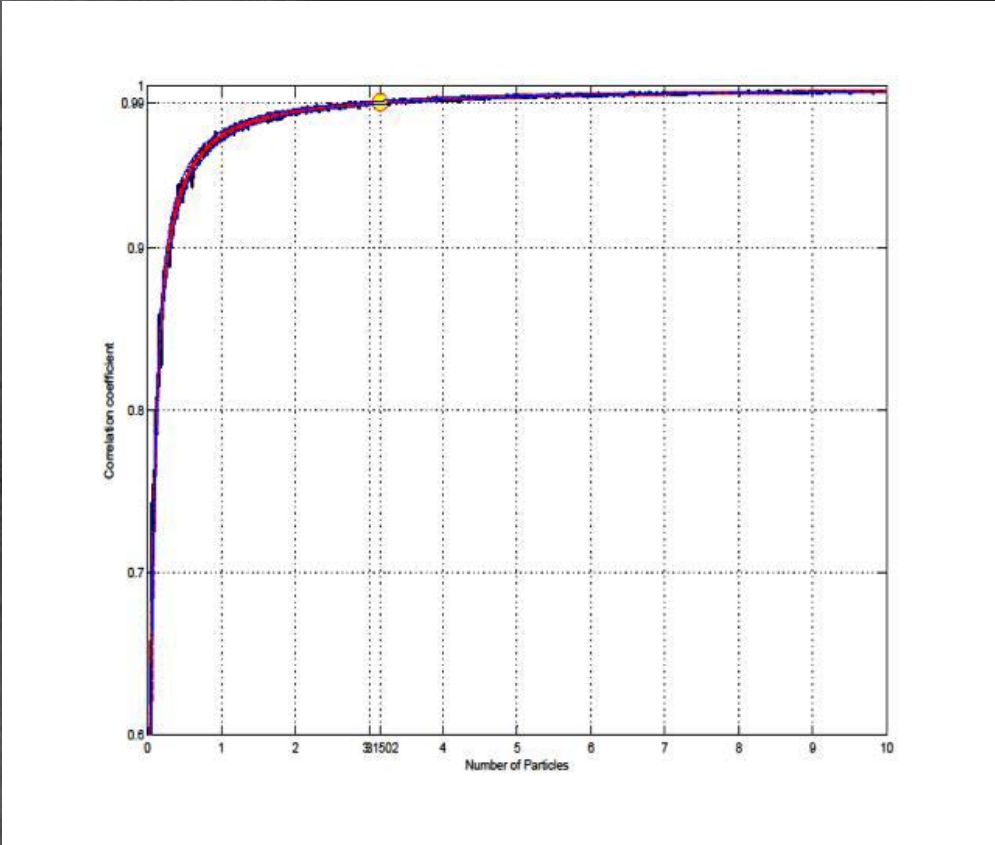


Figure 6 Calibration of one of the scenarios by finding the number of particles needed to reach 99% of the correlation coefficient

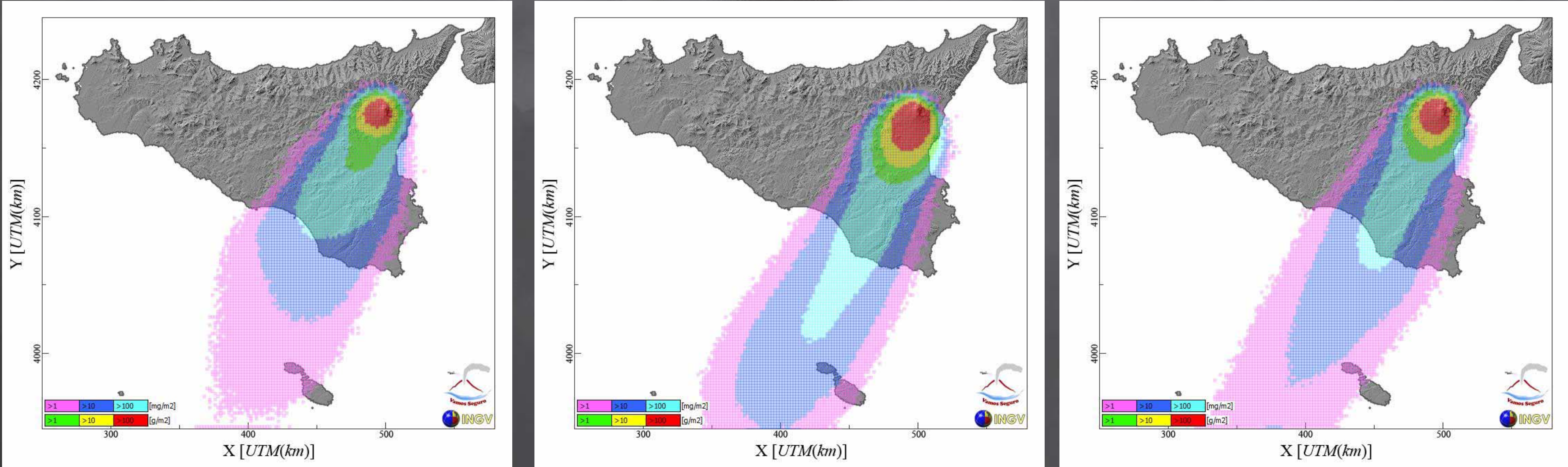


Figure 4 Model simulations for the 3 different scenarios S1, S2 and S3 showing volcanic ash deposition on the ground after 12 h from eruption



Satellite view of Etna erupting taken from the North West with the Maltese Islands in the top right hand corner.

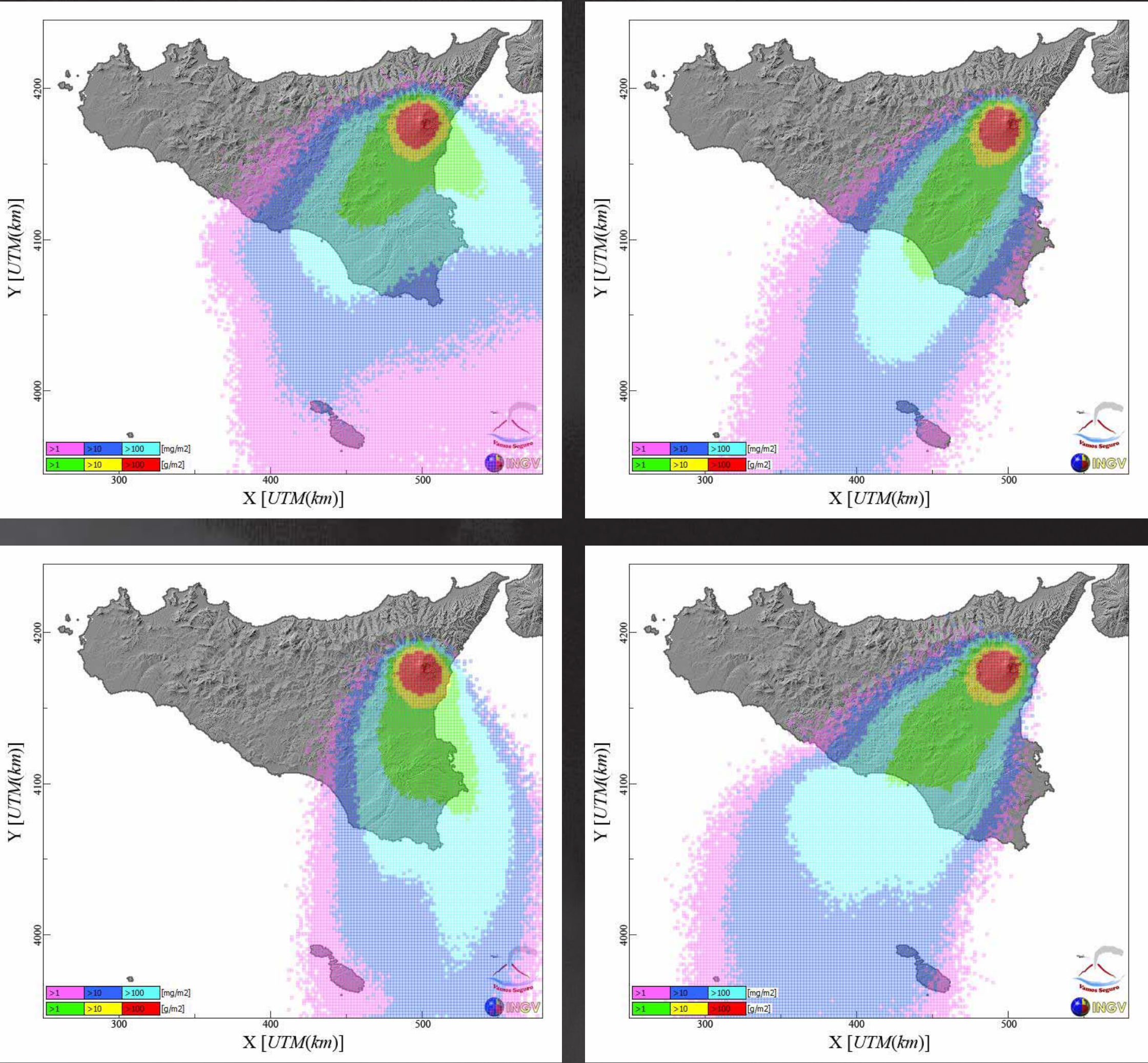


Figure 5 Model simulations of occurrences where volcanic plume reaches the Maltese islands (18 hours after eruptions). Top: winter, spring; Bottom: summer, autumn.