



## **Atmosphere, chaos theory and the Weather Game: an outreach activity to discuss uncertainty in weather forecasts**

Valentina Grasso (1,2), Valerio Capecchi (1), Francesco Pasi (1,2), Riccardo Benedetti (1), and Bernardo Gozzini (1)

(1) Consorzio LaMMA, Environmental modelling and monitoring laboratory, Sesto Fiorentino, Italy (info@lamma.rete.toscana.it), (2) CNR Ibimet, Italian National Research Council, Sesto Fiorentino (FI), Italy (info@ibimet.cnr.it)

In the last decade, hyper-precise weather forecasts became the usual way of delivering a weather prediction, mainly thanks to the diffusion of smart-phone. People have been used by weather-app to receive a forecast tailored for their specific needs, almost personalized and often highly-precise in time and space, disregarding that precision and accuracy are inversely correlated when we talk of predicting the weather. Uncertainty is in fact inherent in every weather forecast, both probabilistic and deterministic. As part of its outreach activities, the LaMMA consortium, institutional weather service of Tuscany region, developed a science-education activity for high-school students focused on Chaos theory and decision under uncertainty. The aim is to illustrate to students the limits of weather predictability, describe the basics of the Chaos Theory and non-linear atmospheric process, and the consequent uncertainty inherent in weather forecasting. During the activity, students are also engaged in role-playing “the Weather Game”, where they imagine to be the mayor of a small city who is called to take decisions under uncertainty; using probabilistic forecasts they have to decide whether to buy an assurance as protection against severe weather or take the risk. The Weather Game (an adaptation of the game developed by ECMWF within the training on Ensemble products) is aimed at showing students rational rules for taking effective decisions under uncertainty based on the Costs/Losses ratio. Eventually, discussing their choices as mayors is also a great opportunity to show them how often behavior is instead irrational due to cognitive bias and psychological shortcuts that we use in such situations. Being aware of such mechanisms is the very first step to reduce their impact and make better use of weather forecast. The activity has been also proposed in training for the personnel of Civil Protection.