

-We cannot escape probabilities

by Anders Persson, Meteorological and hydrological consultant, Uppsala, Sweden

andersoscar.persson@gmail.com

Why do we still have weather forecasters?

With the development of numerical weather prediction (NWP) models, forecasters should have become obsolete already in the 1980's. But they are still with us and maybe more than ever before, in particular in the private sector. This indicates that they must be doing "something valuable".

The relative forecast uncertainty has not changed

Although the absolute forecast uncertainty has decreased thanks to the NWP the uncertainty relative to the public's expectations has stayed unchanged. Forecasts will never be seen as "perfect" and there will always be a need to know "how good they are" – **we cannot escape probabilities**.

Turning a disadvantage into an advantage

Clever meteorologists have always used forecast uncertainties to their advantage by acting as "intuitive statisticians". On one hand they have used forecast uncertainty to provide more useful forecasts, on the other hand as an opportunity to demonstrate their knowledge and experience.

A week's course in probability theory

The strong element of "intuitive statistics" in weather forecasting has rarely been reflected in the curriculum. This course outline starts from the different definitions of probabilities:

Monday: From ***the classical definition of probability***, with tossing coins and dice, we move on to combinatorics which, among other things, tells about the problems trying to add or divide probabilities in time and/space.

Tuesday: ***The frequentist definition of probabilities*** involves statistical calibration and verification of probability forecasts. How does the "proper" Brier score "know" my true opinion?

Wednesday: ***The subjective definition of probabilities*** is controversial but finds many applications in meteorological forecasting. From conditional probabilities we explore the "Bayesian" nature of weather forecasting.

Thursday: ***Decision making from probabilities*** cannot be based on the common cost-loss model only. It suggests we prefer a 80% gamble to win 1000€ than to be given 700€ straight in the hand. The Kahneman-Tversky "prospect theory" suggests we should do the opposite – **as most of us would!**

Friday: ***The psychology of probabilities*** deals with the communication of uncertainty and how to avoid common pitfalls. Verbal statements and intervals work as well as probabilities. Using the "framing effect", the "base rate" and the "regression to the mean effect" helps to communicate and interpret the probabilistic forecasts.

