RASP, A FREE MODEL FOR PREDICTING THERMALS

Jean Oberson, www.soaringmeteo.ch, © February 2010.

RASP model (Regional Atmospheric Soaring Prediction) has been developed by John W Glendening, nicknamed Dr. Jack (www.drjack.info /), Phd in atmospheric physics and glider pilot in California. He brought together and coordinated a set of high-level free software, according to GNU / Linux philosophy, to create RASP. RASP has a better resolution (1-12 Km) than the macroscale world models (about 50 Km resolution) and provides more specific forecast for thermals. A 4 km resolution RASP model cannot cover the entire world, so such a "fine-mesh" model is "nested" inside a "coarse-mesh" model, having larger-spacing grid points and larger domain, which provides "neighboring" points along the lateral (outside) boundary of the fine-mesh model. The coarse-grid model typically covers the entire globe as the U.S. GFS (Global Forecast Model) used by RASP (figure 1). Outside USA, GFS becomes so the mother domain of RASP.

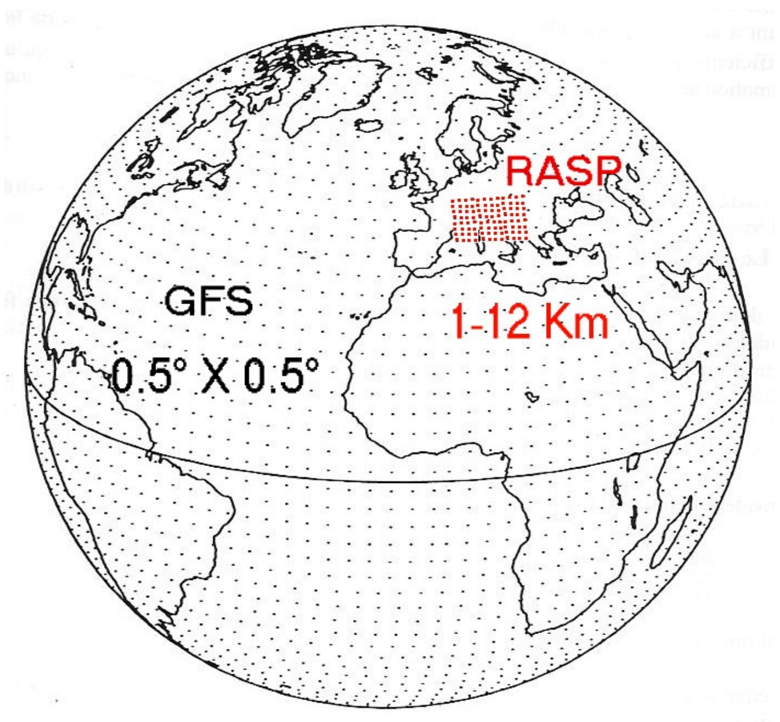

Figure 1: the "fine-mesh" RASP model (resolution 1 to 12 Km) is "nested" inside the "coarse-mesh" world GFS model (resolution 0.5° i.e. about 50 Km).

In four main steps, RASP performs successively:

1. The download of the data produced by super-computers of the U.S. GFS model. There are about 100 to 300 MB of data representing the values of temperature, pressure, humidity, wind, etc.. of the whole atmosphere at the initialisation time. They are distributed into GFS 50Km meshes and, after a short adaptation step into a few Km RASP meshes, are the starting values of RASP.

2. The simulation calculations and forecasting themselves made by the main software called WRF (Weather Research & Forecasting model, www.wrf-model.org/index.php) using data from step 1. WRF only provides numerical data, is very greedy and used during several tens of minutes the 100% CPU of a well-equipped PC. That is because it solves millions of complex equations that satisfy the laws of atmospheric physics.

3. The achievement of weather graphs by the weather graphics routines NCL (NCAR Command Language, www.ncl.ucar.edu /) and from the numerical data of the step 2. The user can thus represent the results more userfriendly. There are two types of graphs representing the forecast at a given time (e.g. 9, 12 or 15 GMT): (1) maps of the entire forecasting field and (2) upper air profiles (or soundings or aerological diagrams) at a selected location.

4. The upload of the step 3 graphs onto a remote web server. Thus each interested pilot can look at these graphics classified by type, location and date in web pages.

The installation of this set is much more complicated than a standard application on PC. The operator should also define and set the geographic area (domain) of flight. But for a Linux aficionados who knows a little about the principles of weather models, it is not impossible. He can thus create a RASP area (www.drjack.info / twiki / bin / view / RASPop / WebHome) for his beloved flight area. On the www.drjack.info / RASP / index.html, you will find a list of worldwide operational RASP, implemented by pilots. RASP needs a powerful machine. My choice is a four-processor 2.83 GHz running on a Ubuntu-Linux environment. I am continuously developing 1-7 Km resolution RASP implemented in two main areas: (1) the Alps, especially Western Swiss Alps and (2) the famous Bir – Billing region for paragliding in the Indian Himalayas. Because I did not know anything about Linux and I was unfortunately addict to the foul MS-Windows (now thanks to RASP, Linux and my friends, I am healed), some Linux friends helped me for the first steps.

RASP bases on the fundamental concept of convective boundary layer (CBL). To interpret RASP maps and profiles, I can only invite you to read about this subject in the present web site (www.soaringmeteo.ch). In the same web site you can also find documents about general considerations of models as well as how to practically, easily and rapidly interpret RASP sounding and RASP charts. CBL predictions are particularly affected by grid resolution errors resulting from surface averaging effects (lack of resolved topography) and from the model's finite-difference equations lacking proper resolution of actual atmospheric differences and are often much less affected by other errors, so better model resolution is especially valuable for soaring predictions.