Education

Overview

Nowadays meteorological phenomena play crucial role for the technical infrastructure (transport, communication, power safety) as well as in social life (personal security, health, ecology, tourism, recreation). The present world becomes more sensitive to hazardous natural phenomena including severe weather. As a result meteorological education is a very essential task.

Remote sensing data have a great potential at each level education due to their vivid form. Weather radar data can be useful as a comprehensive source of knowledge for lessons in atmosphere physics, geography, meteorology, and hydrology. Spatial and temporal properties of precipitation fields can be clearly depicted, which is especially valuable in the case of physics of convective phenomena route. Particular kind of employed weather radar data is conditioned by level of the education (primary, secondary, or high schools) and its profile.

Moreover, nowadays education about practical taking advantage of radar-derived data available on webpage as the most current meteorological information becomes very important. Handbooks are also available on-line, for instance “Doppler radar meteorological observations” (NOAA, 2009), additionally more detailed information often complements webpages providing weather radar data.

Data usefulness

- All possible kinds of the data depicted in informative form, especially in graphical formats, with any external information as a context.

Examples of implementations

Visualization of atmospheric processes

The power of the modern versatile visualisation tools is that they allow comprehensive analyses of radar data (Figs. 1, 2, 3, and 4). Using the 3-dimensional visualization possibility the student receives a quick and almost real-time overview of meteorological phenomena. Due to the complexity of atmospheric processes it can be beneficial to look at generalised views. This enables the student to gain better understanding of the processes involved.

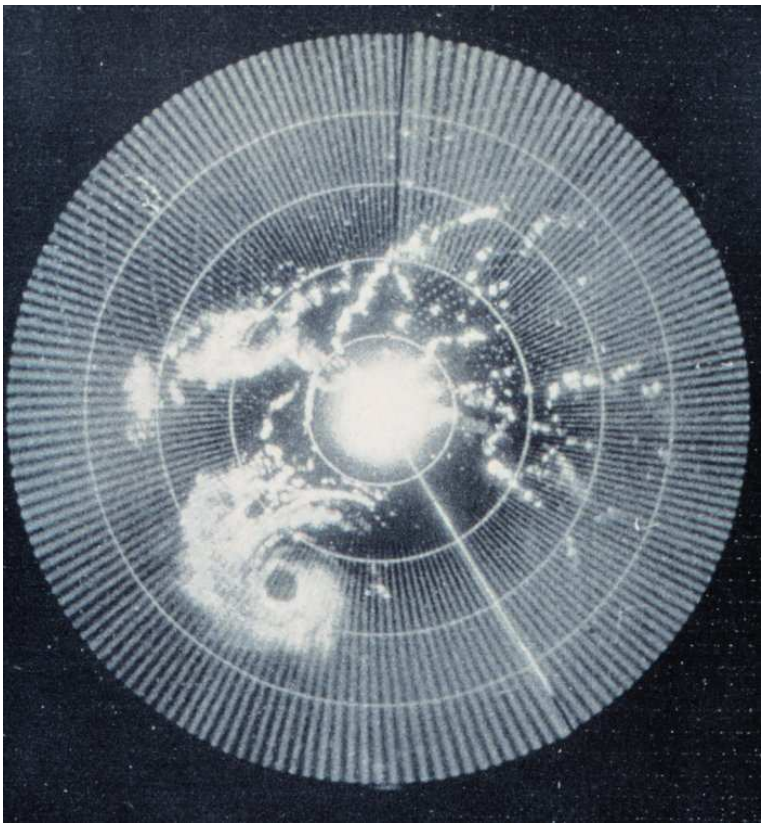

Fig. 1. Visualization of weather radar data according to 1960s technology
(Hurricane Abby, British Honduras, 19 July 1960)
(http://www.photolib.noaa.gov/htmls/wea01219.htm).

Visualization also includes the ability to examine data in different ways, for example, viewing the structure associated with an storm cell via its reflectivity fields, examining its movement and development.

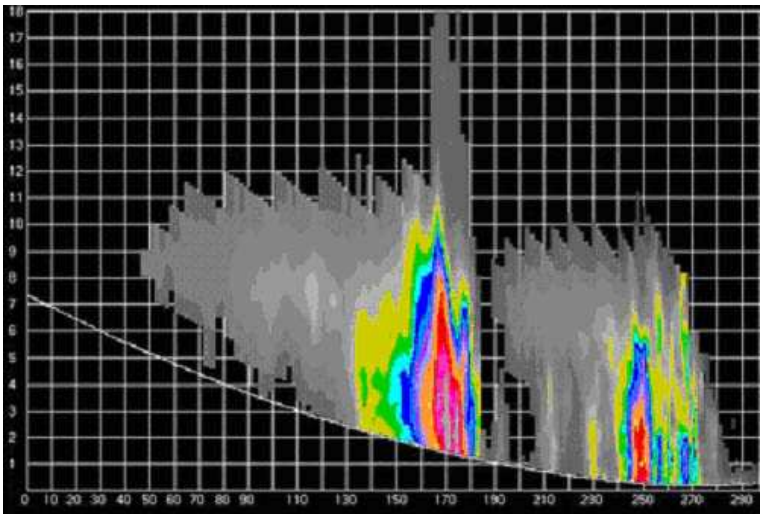

Fig. 2. Vertical cross-section through storm cell (Exeter radar, Canada, 13 August 2003)
(Environment Canada, http://www.msc-smc.ec.gc.ca/).

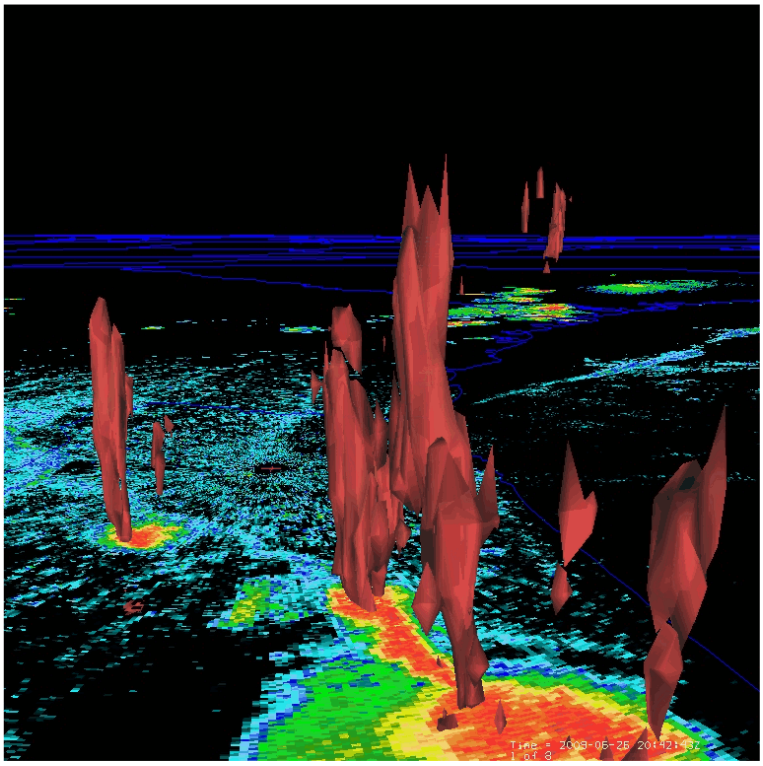

Fig. 3. 3-D visualization of atmospheric front (Florida, 26 June 2009) (http://www.rainmanweather.com/).

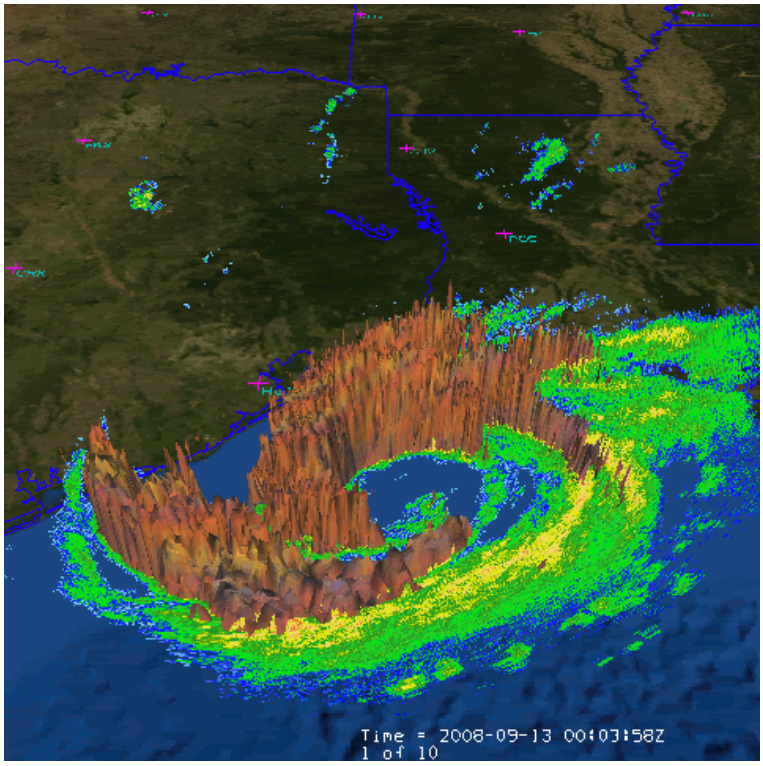

Fig. 4. 3-D visualization of tornado (Florida, 13 September 2008) (http://www.rainmanweather.com/).

Illustration of weather forecast broadcasts

In order to make it easier to understand precipitation analyses and forecasts (nowcasts) on TV or Internet broadcasts the clear 2-D and 3-D animations are often generated (Fig. 5). Moreover, such animations can be useful to explain mechanics of front, storm, etc., and to depict initiation and life cycle of the phenomena. They are especially informative in combination with meteorological satellite data.

Fig. 5. Weather broadcast on TV using radar image animation (CNN)

Literature

NOAA, 2009. Doppler radar meteorological observations. Washington, DC (http:// www.ofcm.noaa. gov/fmh11/fmh11.htm).

RainmanWeather: http://www.rainmanweather.com/.