Sensors in Weather Reporting

“We all know that the weather with which the barometer sympathises, is considered to consist of three independent variables – the velocity of the wind, its temperature, and its dampness. It is a question how far the direction of the wind need be reckoned as a fourth distinct influence” – Francis Galton (first weather reporter) [Galton1870]

A Little History

Weather predictions date back millennia, to at least 4th Century BC Babylonians, and recorded weather measurement, on which forecasts are made, date back hundreds of years, to the Central England Temperature series, which was collected by amateurs and has continued to be recorded since 1659 [Saner 2007].

Figure 2 1861 Weather Report with Symbols

Figure 1 First Weather Report, 1875

Weather reporting in the media dates back to 1875 with Francis Galton's weather observation maps in The Times (above, with Galton's 1861 map using symbols); radio broadcasts of weather information started in 1916 at the University of Wisconsin-Madison's 9XM studio, with UK radio broadcasts of weather information in 1922 (British Broadcasting Company), and commercial US radio reporting of weather forecasts in 1923 (Edward Rideout's reports on WEEI Boston; [Kutler 2003]). Television weather reporting started in 1941 at WNBT-TV, New York [Monmonier 2000].

The sensors and platforms used in weather reporting vary from manual reading and reporting of simple sensors in Stevenson screens, to digital instruments, weather balloons and satellite-mounted Doppler radars. Outputs from these sensors are usually gathered by national, local or global meteorological organisations (e.g. NOAA, or the World Meteorological Organisation); these outputs and/or detailed analysis of them, including weather forecasts, are passed to media outlets for use in weather reports.

Early US television weather reports (e.g. Weather Man in the 1950s) were simple textual descriptions (e.g. "Sunny, chance of showers") without maps. The first use of satellites in weather reporting was in 1960, when the TIROS-1 was launched to send back cloud cover images of Earth from two television cameras (one high-resolution, one low-resolution); later (1960-1965) TIROS satellites included radiometers (measuring infrared radiation) with missions including detecting cloud cover during hurricane seasons and detecting snow cover; news stories arising from their use included the early detection of Hurricane Esther in 1961, and the first complete view of the world's cloud cover in 1965. The camera resolution of the last TIROS satellite launched was 2 miles at the camera centre (the area covered by a camera pixel is typically larger at the camera image's edges than at its centre), with each image covering 640,000 square miles [NASA 2013].

What's Available Online Today

Weather reporting using satellite radar pictures and outputs from weather stations are now commonplace. The radar spectrum has several 'notches' where radar waves are absorbed by water molecules, making storm clouds easier to see; weather stations give temperature, rainfall, windspeed, etc.

The availability of personal weather stations (including wifi-enabled personal weather stations) has made it much easier for weather-based communities to form. Examples of grassroots communities dedicated to sharing local weather reports include:

- CoCoRaHS (Community Collaborative Rain, Hail and Snow Network),
- Weather Underground's Personal Weather Station Network,
- AnythingWeather.com
- US National Weather Service's eSpotter community
- Greatweather (UK)

As personal weather stations become increasingly automated and include more sensor types, this trend for micro-weather reporting and its potential to fill in data gaps in macro reporting in most likely to continue.

References

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