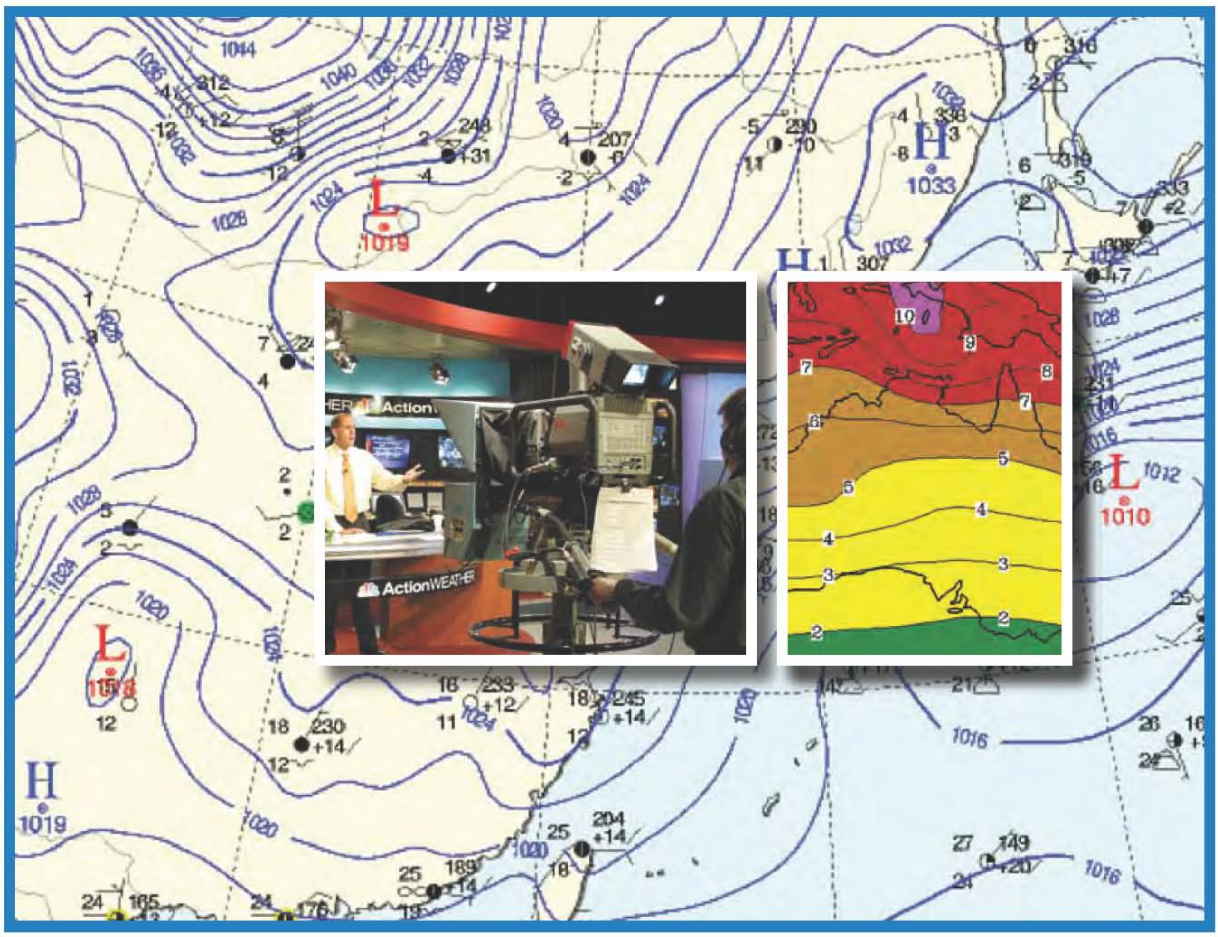
EXAMPLES OF BEST PRACTICE IN COMMUNICATING WEATHER INFORMATION

PWS-17

WMO/TD No. 1409



PHOTOS: KOREA METEOROLOGICAL ADMINISTRATION | WORLD BANK | AUSTRALIA BUREAU OF METEOROLOGY

Lead Author and Coordinator: Claire Martin

(Contributions by: Jon Gill, Ivan Cacic, Samuel Muchemi and Jose Rubiera)

Edited by: Haleh Kootval

Cover design by: Alexandre Keshavjee

WMO/TD No. 1409

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Chapter 1
INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

This document presents some examples of how to effectively communicate weather information, across a range of services delivery methods and information types.

Examples include graphical presentations on the internet and television, good use of icons and other weather symbols, and a case of effective verbal communication on radio.

The examples are real. They have been chosen because they encompass one or more elements of effective communication, such as clear language, or simple but effective use of graphics.

Users of this document are invited to examine the examples and use them as guidance or inspiration when designing services and planning how to communicate them.

1.2 WHO IS THIS DOCUMENT FOR?

This document is intended for use primarily by NMHS staff involved in the preparation and delivery of weather and climate information. This includes operational forecasters as well as those who plan and manage the delivery of services.

This document should be used alongside more formal guidelines that explain the theory and principles of good communication, such as:

- Guidelines on Weather Broadcasting and the Use of Radio for the Delivery of Weather Information (WMO, TD 1278)
- Guide on Improving Public Understanding of and Response to Warnings (WMO, TD 1139)
- Guidelines on Graphical Presentation of Public Weather Services Products (WMO, TD 1080)
- Weather on the Internet and Other New Technologies (WMO, TD 1084)

1.3 HOW TO USE THIS DOCUMENT

The examples are based around different meteorological scenarios, including routine, low impact weather situations, and high impact weather occurring over short time scales (e.g. a severe thunderstorm) as well as longer time scales (e.g. drought).

Each example is presented first, followed by a discussion that explains why it represents ‘best practice’.

Chapter 2
LOW IMPACT WEATHER

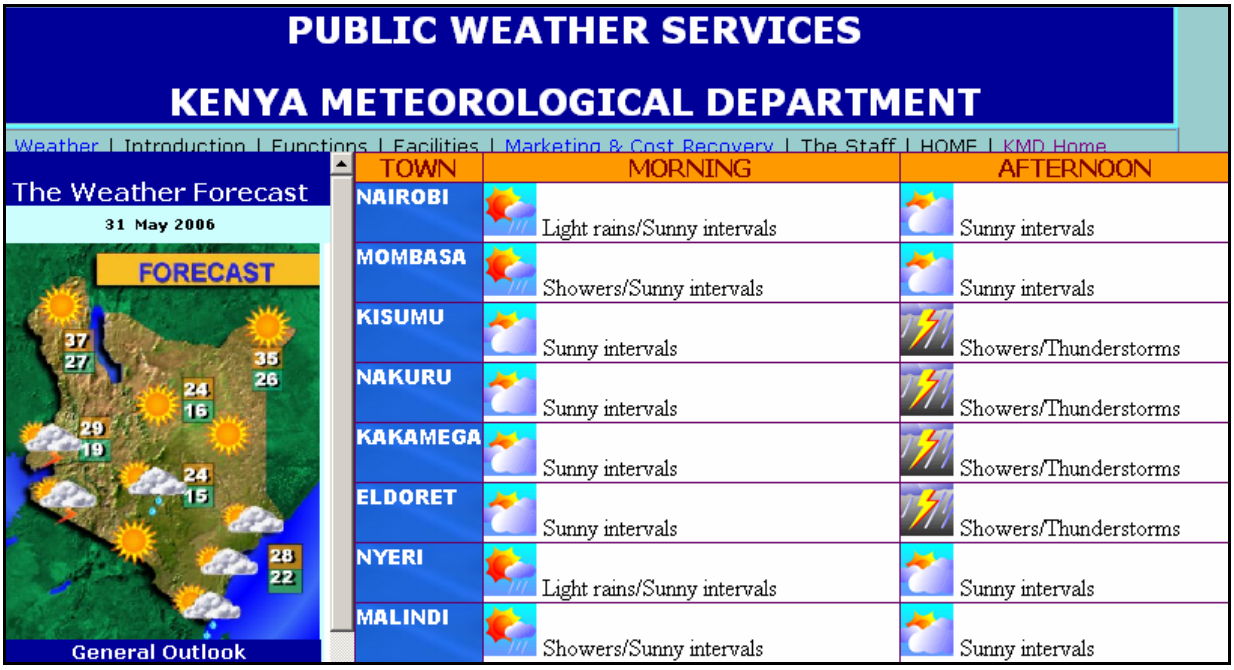
2.1 ROUTINE PUBLIC WEATHER FORECASTS

The regular daily presentation of public weather forecasts is one of the most visible outcomes of the activities of an NMHS. Most NMHSs have extensive experience providing the information upon which these presentations are made, and in some cases, their staff will be directly involved in the presentation itself.

Consequently, the presentations and products used to disseminate the routine daily forecast are often highly evolved, in direct response to the needs of users. Even though the way in which the information is presented should not require significant change, a periodic review is always worthwhile, to ensure that there is continuous improvement, and that presentation methods and formats do not become stale.

Some good examples of effective daily weather presentation are presented below.

EXAMPLE 1: Weather presentation on Internet by Kenya Meteorological Department



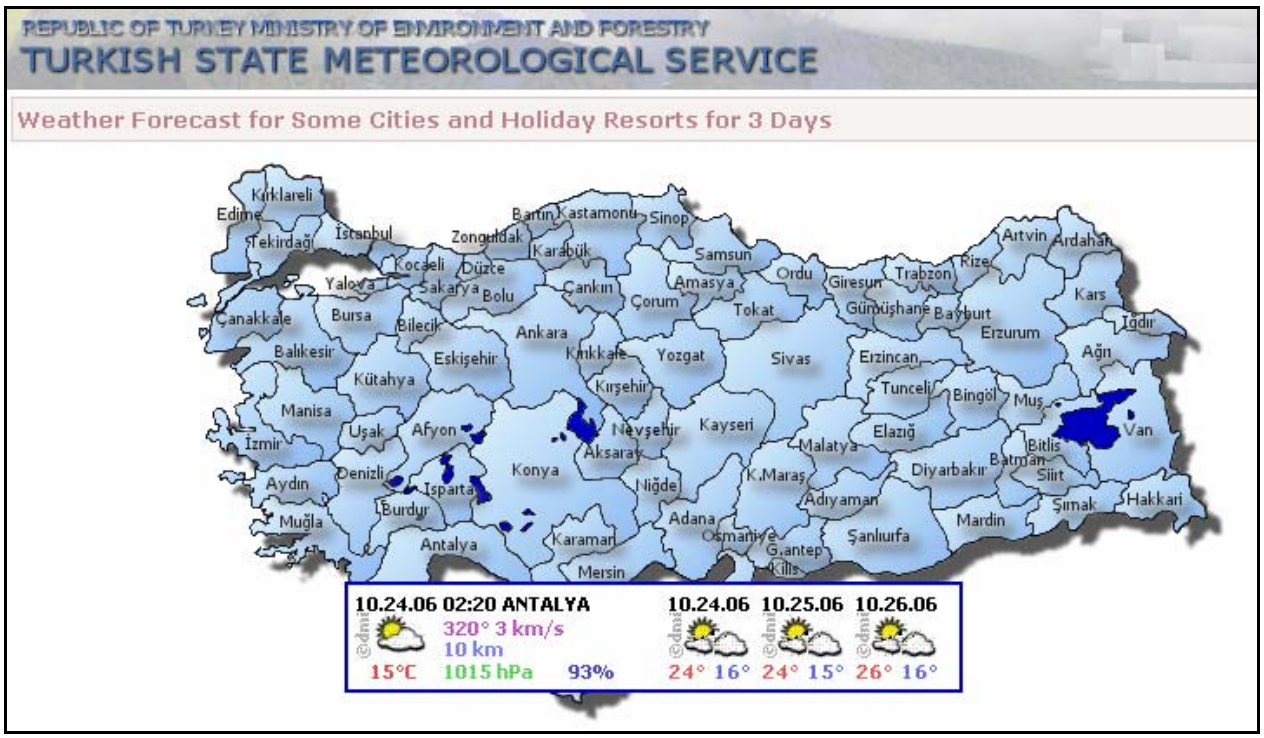
Best practice

The layout of this information is bright, attractive and visually appealing. The forecast information is presented in two parts: the map on the left shows the temperature forecast and expected weather in simple icon format; the table on the right gives a more detailed text forecast. This idea of separating out the information prevents a single map from becoming too cluttered with information. Remember that 'less is more' when presenting complex scientific information in a user-friendly format.

An enhancement to this presentation might be to include place names on the map. Consistency in the style of the weather icons used on the map and in the table might also help users interpret the information correctly.

The map on the left maintains a similar visual style to how it might be shown on television. By using the same style across both media, a visual 'brand' can be developed that viewers learn to associate with the NMHS.

EXAMPLE 2: Web-based interactive map by Turkish State Meteorological Service



Best practice

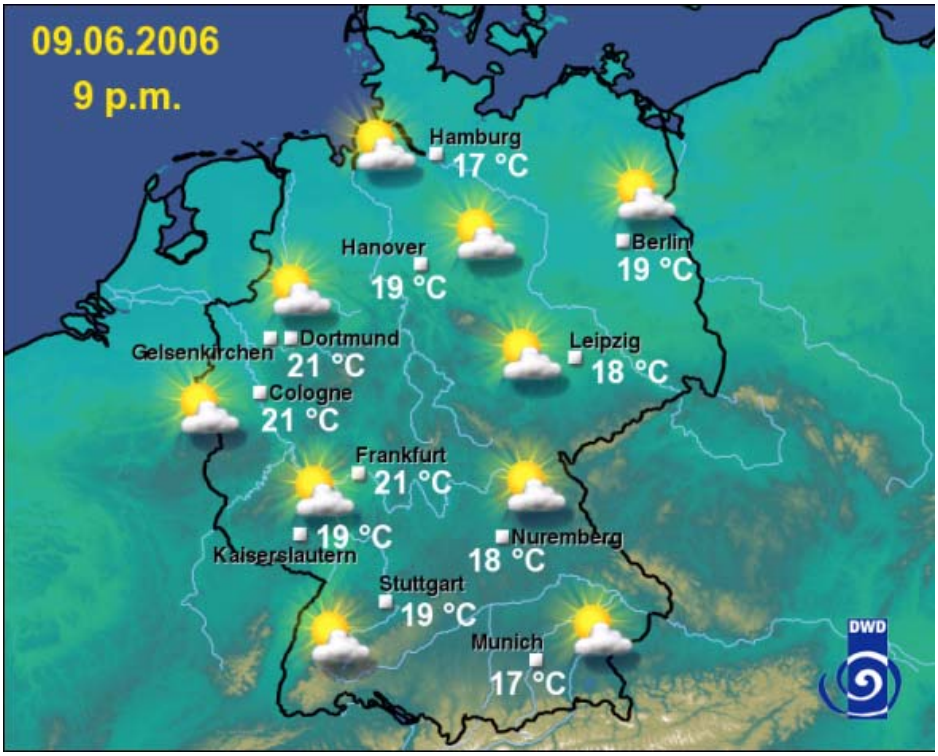
This is a web-based interactive map. As the user hovers the mouse over a place name, a pop-up box appears that presents the current conditions for that place (the left-hand part of the box) and the forecast for the next 3 days, in an informative, succinct style. The use of colour – such as red text for maximum temperature and blue text for minimum temperature – helps the user quickly absorb the information.

By using pop-up boxes, the base map is clean and uncluttered and allows the user to display only the information for the place in which they are interested.

Normally the temperature component of the current weather scenario is one of the most valued pieces of information, and as such, should be displayed with a high degree of prominence. A good idea, as demonstrated here, is to use warm colours, such as red, to highlight maximum temperatures, and use cooler colours such as blue for the minima.

The copyright symbol has been included as part of the weather icon graphic, using a subtle shade of font and placed in a way that does not distract from the graphical presentation of the weather information.

EXAMPLE 3: Weather presentation on television - Germany



Best practice

This is an example of an attractively presented television graphic. The temperature information is presented clearly and the locations are easy to read. The underlying topographic map is very visible without interfering with the main information (the forecast).

This presentation would be enhanced further if it included a more clear description of the parameter, i.e. whether it is the forecast or observed temperature. Also, most people refer to the date as a number of the month and the name of the month (e.g. 9th of June, rather than 09.06). Nevertheless, these issues are not so significant for a TV weather presentation, where the presenter provides a verbal commentary and would place the graphic in its proper context.

2.2 CURRENT WEATHER CONDITIONS

The presentation of information on current weather conditions focuses on conveying point-specific data about the situation at specific locations, as well as area-based information such as radar or satellite imagery.

Weather maps (synoptic charts) are also an effective way of communicating the overall pattern, although these sometimes require a higher-level of user understanding to be interpreted correctly.

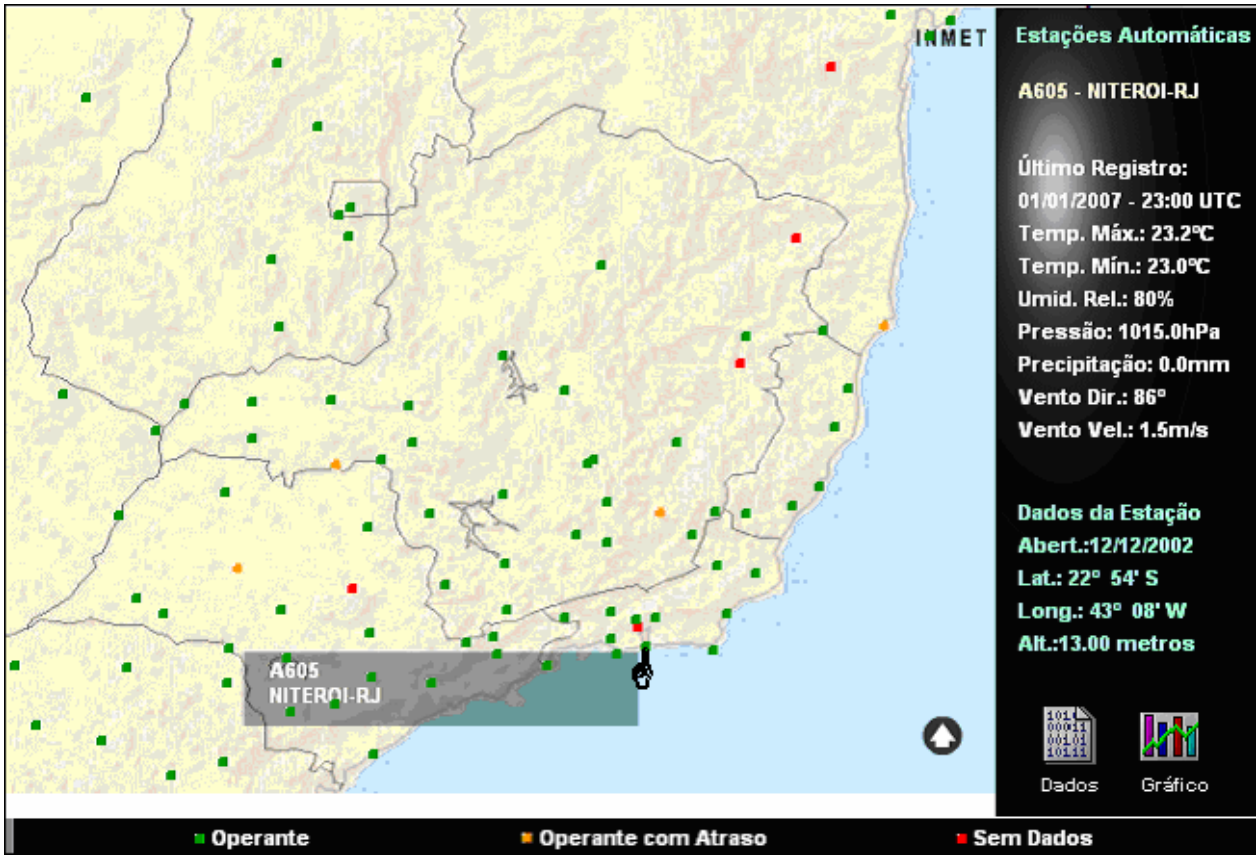
The question of timeliness is an important one for this type of information. If the information is not updated frequently, then it is not useful to people wanting to know what the current situation is.

It is common practice in the electronic media for weather presenters to mention the weather conditions at the time of the broadcast, e.g. it is a simple matter to state the current temperature as part of a weather bulletin attached to an hourly news broadcast.

Current weather conditions can be displayed graphically for most forms of presentation in a highly varied fashion. No matter what the preference, it is always advisable to make the font size, type set and choice of colour easy to read.

The Internet, due to its immediacy and accessibility, is an excellent medium for presenting current weather information in both text and graphical format. The following are some best practice examples.

EXAMPLE 4: Website weather presentation by Brazilian Meteorological Institute



Best practice

This presentation of current weather conditions comes from the website of the Brazilian Instituto Nacional de Meteorologia.

On the left, a map is displayed that shows the locations of automatic weather stations. The locations are colour-coded, with green indicating that current observations are available and red indicating where observations are presently unavailable.

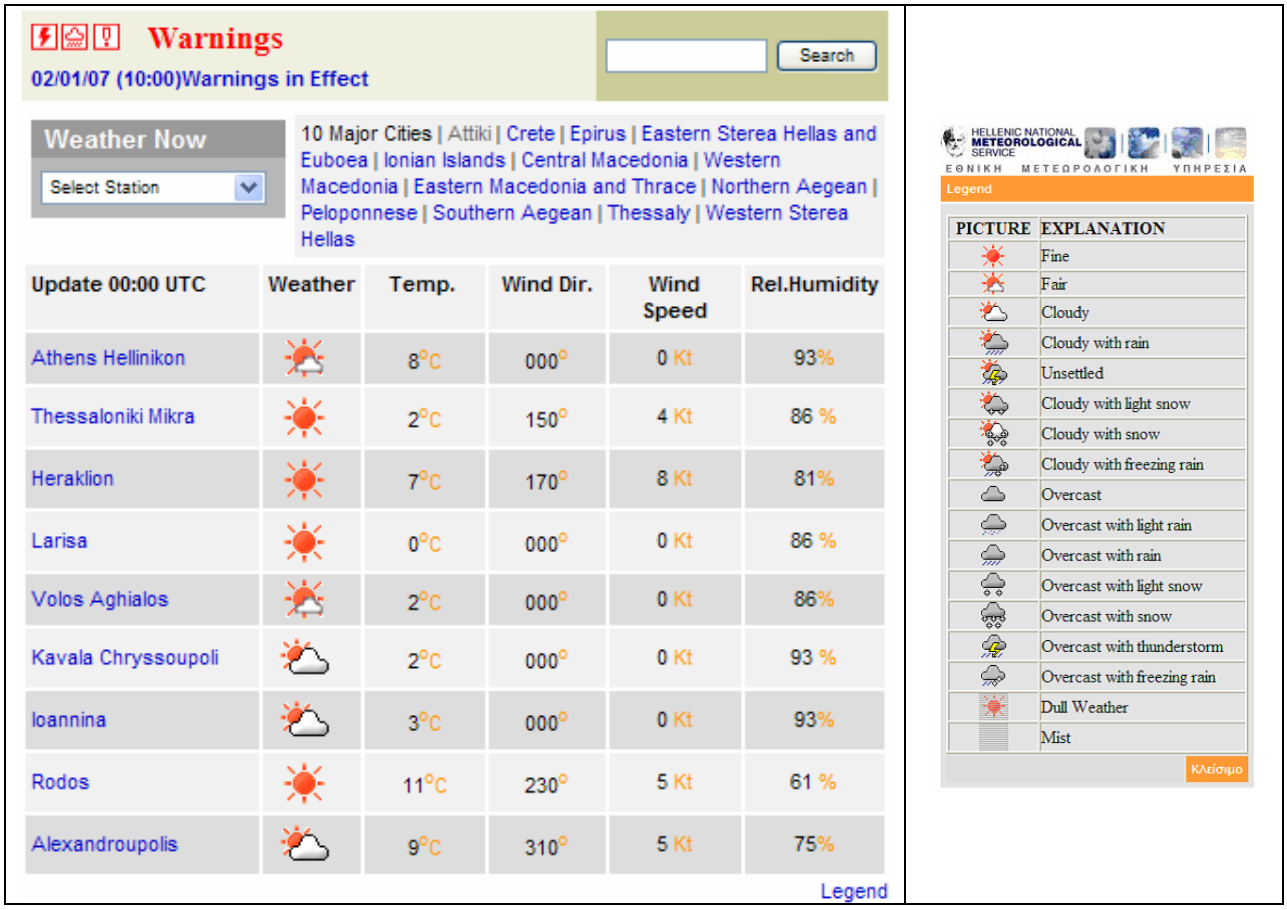
As the mouse cursor is held over each location, a pop-up window appears that displays the name of the location. Note that the window is transparent so that the underlying locations are not obscured.

When the user clicks the mouse on the location, the current weather information is displayed in the right-hand pane, together with some basic data about the location (latitude, longitude and elevation). Icons are also shown that provide links to further information.

Icons in the bottom right-hand corner provide links to time-series of the data for the selected station, in both tabular and graph forms.

An enhancement to this presentation might be to include region names on the map, along with the names of significant towns and cities (but not too many, to avoid clutter).

EXAMPLE 5: Weather presentation on Internet by the Hellenic National Meteorological Service



Warnings

02/01/07 (10:00)Warnings in Effect

Search

Weather Now

Select Station

10 Major Cities | Attiki | Crete | Epirus | Eastern Sterea Hellas and Euboea | Ionian Islands | Central Macedonia | Western Macedonia | Eastern Macedonia and Thrace | Northern Aegean | Peloponnese | Southern Aegean | Thessaly | Western Sterea Hellas

Update 00:00 UTC	Weather	Temp.	Wind Dir.	Wind Speed	Rel.Humidity
Athens Hellinikon		8°C	000°	0 Kt	93%
Thessaloniki Mikra		2°C	150°	4 Kt	86 %
Heraklion		7°C	170°	8 Kt	81%
Larisa		0°C	000°	0 Kt	86 %
Volos Aghialos		2°C	000°	0 Kt	86%
Kavala Chryssoupoli		2°C	000°	0 Kt	93 %
Ioannina		3°C	000°	0 Kt	93%
Rodos		11°C	230°	5 Kt	61 %
Alexandroupolis		9°C	310°	5 Kt	75%

Legend

HELLENIC NATIONAL METEOROLOGICAL SERVICE

ΕΘΝΙΚΗ ΜΕΤΕΩΡΟΛΟΓΙΚΗ ΥΠΗΡΕΣΙΑ

Legend

PICTURE	EXPLANATION
	Fine
	Fair
	Cloudy
	Cloudy with rain
	Unsettled
	Cloudy with light snow
	Cloudy with snow
	Cloudy with freezing rain
	Overcast
	Overcast with light rain
	Overcast with rain
	Overcast with light snow
	Overcast with snow
	Overcast with thunderstorm
	Overcast with freezing rain
	Dull Weather
	Mist

Κλείσιμο

Best practice

In this example from the Hellenic National Meteorological Service, the current weather conditions are shown in clear tabular form. The layout is efficient, uncluttered and easy to read. The units are given for each weather quantity in a subdued font colour which ensures that the actual values stand out.

Beneath the table is a link to an explanation of the meaning of the icons - shown on the right in the above example.

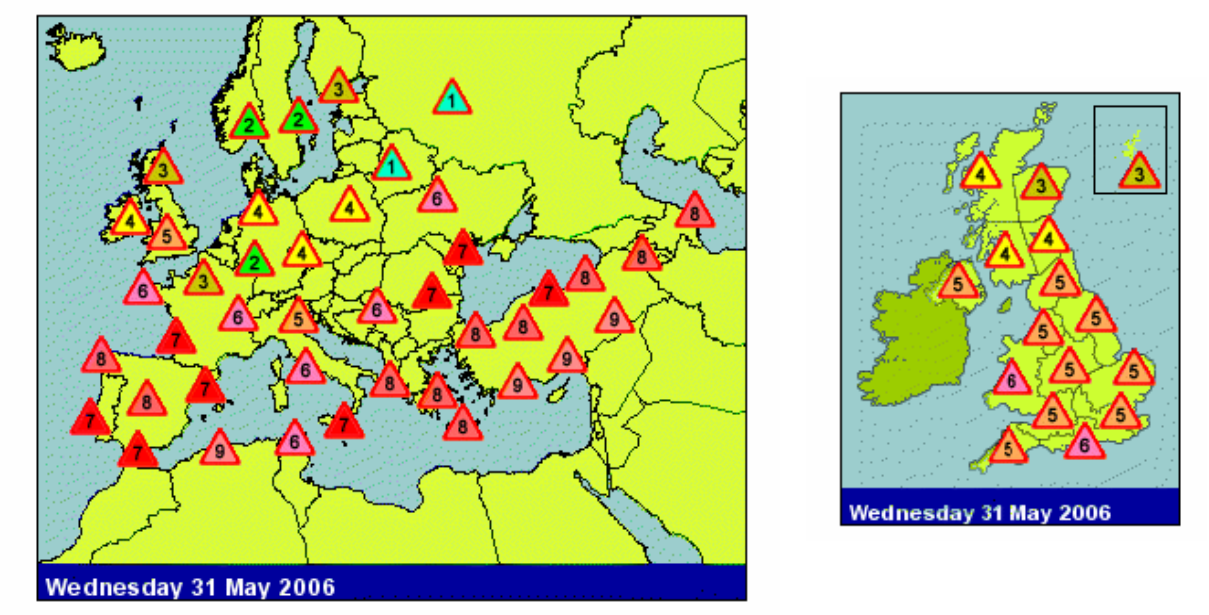
Wind speed and direction are shown here in numerical form. Alphanumerical format for the direction (e.g. SW, NNE, etc) can also be very effective. In either case, it is worth making clear to the end user whether the direction is where the wind is going to, or coming from (the latter being the standard practice). This sort of information could be included in a set of explanatory notes that provide the strict definitions of all the quantities.

Degrees of intensity of precipitation can be indicated in the icon graphic. In the example here, rain is distinguished from light rain by the presence of additional precipitation markers beneath the cloud.

Above the table is a simple list of names of regions that can be used to quickly navigate to other tables covering those areas.

At the very top, where it is most visible, is a prominent statement indicating that warnings are current. This is a very good idea that helps ensure that users of the information are aware of anything particularly significant.

EXAMPLE 6: A simple UV Index forecast presentation by the UK Met Office



Best practice

This is an example of a simple UV Index forecast from the UK Met Office. A broad scale map is shown as well as a national map with greater detail.

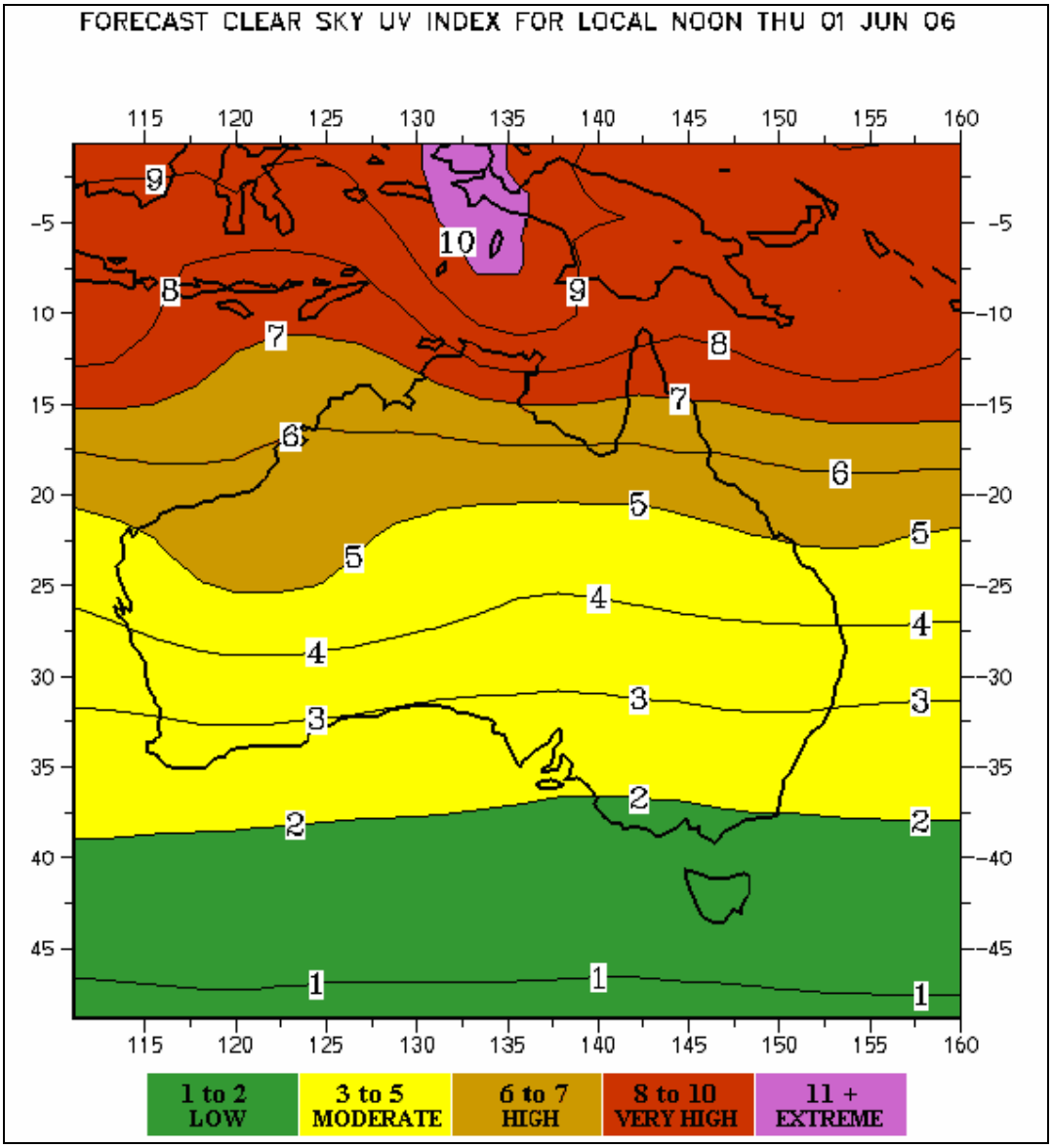
The severity of the UV Index value is depicted numerically, as well as by colour-coding of the triangle surrounding the number. This is an effective use of colour that adds a level of information that may be lost if only the raw number is presented.

It is advisable to stay away from too many colours in one graphic. Not only can this make the graphic appear cluttered and "busy", but it may increase the risk that people with a degree of colour-blindness are unable to interpret the information correctly.

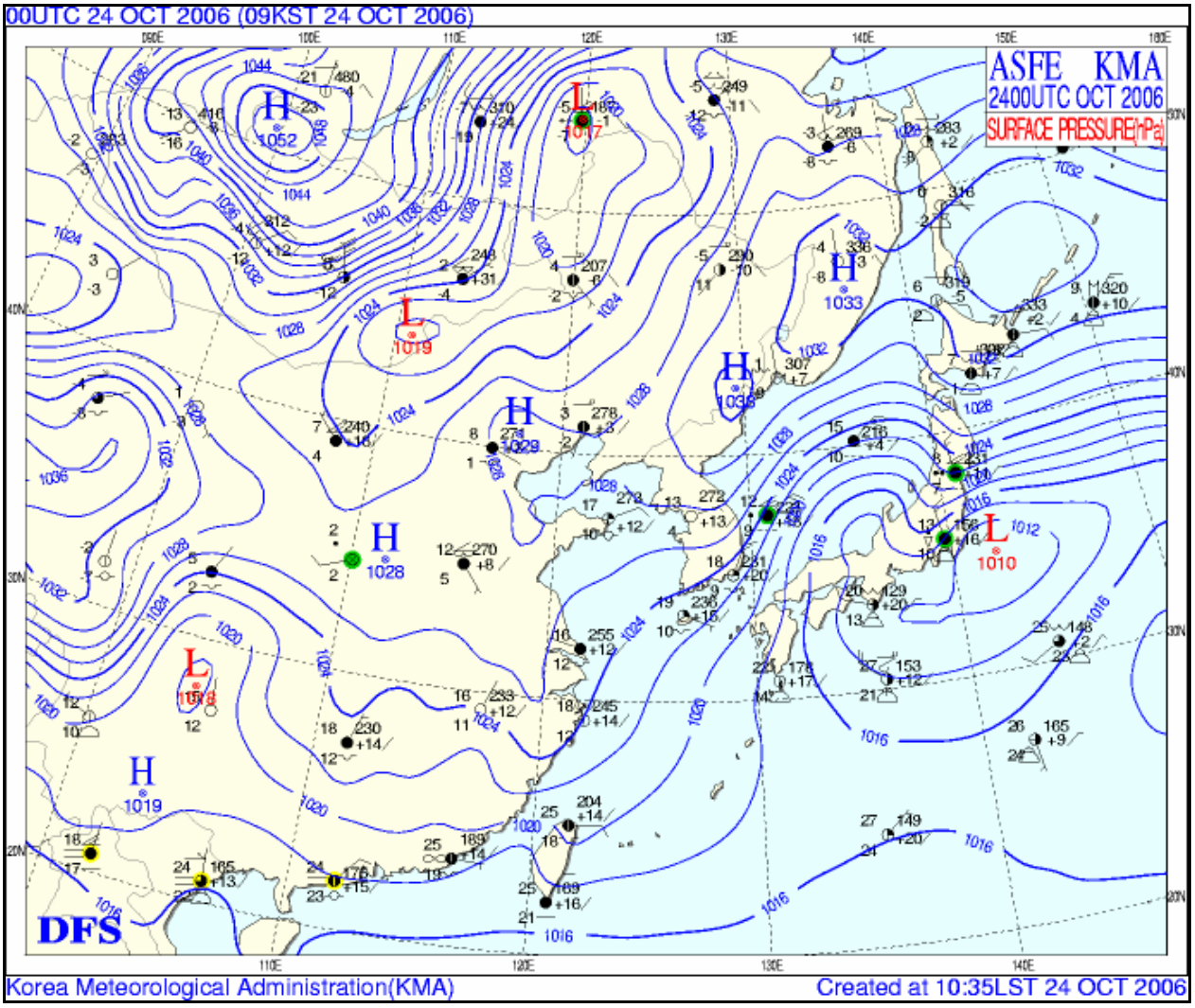
In this example, the colour palette follows a common practice of using cool colours for lower threat and warm colours for higher threat. Interestingly, one could argue that the warmest colour shown here is the deep red used for index value 7, rather than highest index value used which is 9.

Example 6, from the Australia Bureau of Meteorology, shows an alternative way to present this kind of information. The colour scale beneath the map gives a very clear description of the meaning of the colours used. By extending the data coverage across the entire country (Australia) and offshore, a subtle yet informative message is communicated that the phenomenon does not end at identified borders. The graphical representation of the index would benefit however, by the addition of major site locations since many people are unable to identify their location on a map.

EXAMPLE 7: National UV Index Forecast Chart by the Australia Bureau of Meteorology



EXAMPLE 8: A synoptic weather chart by the Korea Meteorological Administration



Best practice

This synoptic weather chart from the Korea Meteorological Administration is clearly labelled. The validity time of the analysis is shown at the top of the chart and the analysis field (surface pressure) is highlighted in red. Colour is also used to highlight the location of low pressure systems and certain present weather conditions (yellow for fog, green for precipitation).

The quality of the analysis is well presented. The surface pressure contours are smooth and show out strongly against the background map. The use of colour to denote the ocean is an effective way to clarify the land-sea border and prevents the contour of the coastline from distracting from the contours of surface pressure.

Inclusion of the surface observation plots would appeal to technically-minded users. They are small enough to not interfere with the analysis.

Chapter 3
HIGH IMPACT WEATHER

3.1 OCCURRING WITHIN A DAY

"High impact" refers to weather that poses a risk to life or property. Presenting information for this type of event is often the most difficult task that an operational meteorological team may encounter. Presenting warnings effectively can be fraught with problems, particularly for short-term events were there is not a lot of time to 'craft' the message. In addition, the importance of public safety means that the message must be accurate, and must effectively convey the key messages. Information must therefore be delivered in an easy to understand fashion.

The importance of communicating weather information on these types of events as quickly as possible cannot be overstated. Dissemination methods therefore need to be speedy and reliable.

The following best-practice examples demonstrate these principles. However, like all the examples in this document, they need not be followed exactly. Rather, the key principles should be noted and adapted to the needs and practices of the local community.

EXAMPLE 9: Weather Warning by Australian Government Bureau of Meteorology

Australian Government Bureau of Meteorology
New South Wales

TOP PRIORITY FOR IMMEDIATE BROADCAST SEVERE THUNDERSTORM WARNING
for
LARGE HAILSTONES and DAMAGING WIND

For people in the
Illawarra,
Hunter,
Central Tablelands,
Metropolitan and parts of the
Southern Tablelands Forecast Districts.

Issued at 5:15 PM Tuesday, 16 November 2004.

Severe thunderstorms are likely to produce large hailstones and damaging winds in the warning area over the next several hours.

Major locations within the warning area include Nowra, Gosford, Scone, Orange, Sydney and Wollongong.

The State Emergency Service advises that people should:
* Move your car under cover or away from trees.
* Secure or put away loose items around your house, yard and balcony.
* Keep clear of fallen power lines.
* Unplug computers and appliances.
* Avoid using the phone during the storm.
* Stay indoors away from windows, and keep children and pets indoors as well.
* For emergency help in floods and storms, ring your local SES Unit on 13 2500.

The next warning is due to be issued by 8:15 PM.

This warning is also available through TV and Radio broadcasts, the Bureau's website at www.bom.gov.au or call 1300 659 218. The Bureau and State Emergency Service would appreciate this warning being broadcast regularly.

Best practice

This is an example of a text-based severe thunderstorm warning issued by the Australian Bureau of Meteorology. The following aspects are highlighted as good practice:

- the very first statement identifies the issuing authority. Before anything else, the user needs to know who the message is coming from;
- the next statement, in the most prominent font of all, describes the importance of the message and what to do with it (top priority for immediate broadcast), followed by what the message is about (severe thunderstorms with hail and wind);
- the next part explains who the message is for. Note that the message is "For people" rather than for an area or location, i.e. the message is personalised and engages with the user;
- the issuing time of the warning is shown prominently, so that users know how current the warning is;
- the next statements reiterate the message that severe thunderstorms with hail and wind are expected and highlight the major population centres threatened. Again, this personalises the message and helps ensure that people know whether they are affected or not;
- a list of possible actions is then provided. Having told people what is happening, they need advice on what to do. It is often the case that local emergency management agencies are directly responsible for managing this part of the warning system, and so they often provide these action statements for the NMHS to include in their warnings. Since speed is of the essence when issuing warnings of this type, the action statements can be developed well before the event occurs, and 'pasted into' each warning as a routine practice;
- a short statement is then included that tells people when to expect the next warning. This reassures people that the situation is continuing to be monitored and that they can expect updates. If no further warnings are expected because the situation is dissipating, then a message advising of this should be issued;
- Finally, people often like to know where they can go to get more information.

EXAMPLE 10: Abbreviated warning for television 'banner'

Australian Government Bureau of Meteorology

New South Wales

TOP PRIORITY FOR IMMEDIATE BROADCAST
SEVERE THUNDERSTORM WARNING

Issued at 5:15 PM, Tuesday, 16 November 2004.

(TV stations please broadcast immediately)

Bureau of Meteorology warns severe thunderstorms expected next few hours. Full details on 1300 659 218

A highly abbreviated version of the warning is a useful product for immediate broadcast on television as a 'banner' or 'crawler' that runs along the top or bottom of the screen. This does not interrupt the program being shown but makes viewers aware that a threatening situation has developed and advises where they should go to get more details. Only the highlighted part at the bottom needs to be broadcast.

Since the message is highly abbreviated, detailed information regarding the area under threat is not possible. Close liaison is therefore necessary between the NMHS and the broadcaster to ensure that the message is not broadcast to those areas not affected – otherwise people who are not under threat will think the message affects them.

3.2 OCCURRING OVER A PERIOD OF SEVERAL DAYS

The principles described above are also relevant for high impact weather events that persist over several days, such as tropical cyclones, persistent flooding rains and blizzards.

Because these events tend to be more protracted, there is not quite the same demand for brevity in the message. Or, to put it another way, there is time available to operational staff to provide more detailed messages, and time for the users to absorb this information and make careful plans. This does not mean that the messages should not still be clear and simple; rather, there is the opportunity to provide more information about the threat, as well as describe possible alternative scenarios.

For these types of events, there is also greater opportunity to use additional media, such as regular (e.g. evening) television news programs, and newspapers, to convey the information.

It is also possible to build up a story, or narrative, about the event as it evolves. For example, initial information might focus on the fact that a situation is developing and that people should start to prepare. Once the event has started, then the information may become more focussed on describing the actual event and how people should be responding. After the event, there is time to prepare information on what happened and lessons learned.

EXAMPLE 11: A newspaper severe weather report by Associated Press

Tropical Depression Expected to Drop Heavy Rain on Hawaii's Big Island

By Mark Niesse
ASSOCIATED PRESS
5:44 p.m. July 20, 2007

HONOLULU – A tropical depression is expected to bring floodi, strong winds and high waves when it churns past Hawaii's Big Island late Friday, weather officials said.

The storm could drop 5 to 10 inches of rain on the state's southernmost landmass and pound it with 11-foot waves, the National Weather Service said.

The depression, which was this year's first Pacific tropical cyclone named Cosme before it weakened earlier this week, will bring sustained winds near 35 mph as it passes 170 miles south of the Big Island into early Saturday, said Robert Ballard, science and operations officer for the Weather Service.

“The biggest threat people need to pay attention to is the rains, floods and possible thunderstorms,” Ballard said. “We want people to remember to play it safe. Don't drive into areas where water covers the road.”

A flash flood watch, which means that flooding is possible but not imminent, remains in effect through Saturday afternoon. Officials also issued a wind advisory for summits on the Big Island and Maui, where gusts could reach 50 mph, Ballard said.

“This is probably not the best weekend for camping,” said Troy Kindred, administrator for Hawaii County Civil Defense. “The effects of the storm could vary quite a bit.”

At 5 p.m. EDT, the center of the tropical depression was about 270 miles southeast of Hilo. It was moving west at 17 mph with maximum sustained winds of 35 mph.

Cosme was a tropical storm Monday when it was upgraded to hurricane status as its winds intensified to 75 to 80 mph. But it was downgraded to a tropical storm the next morning after its winds dropped below 74 mph. It further weakened to a tropical depression.

Best practice

This is an excellent example of good reporting of weather events through the print media. The report starts with a short but, nevertheless, punchy sentence that informs the reader what the hazardous weather phenomenon is, the location where it is expected and its likely impact. It also stamps the authority of the report by naming the source as weather officials - a tacit reference to the National Weather Service - making it credible to the reader. The total effect of this is that it captures the attention of the reader right from the start, and makes the reader want to learn more.

The report presents expected weather in figures and explains their implications in terms the reader can relate to, giving advice on what not to do and the places to avoid going to. The level of alarm associated with the depression is put in perspective, and the writer takes this opportunity to educate the reader on the meaning of a flash flood ‘watch’, explaining that it only means that flooding is possible but not imminent.

In a relatively small space, the reporter has brought out the essential information to the reader including the history of the weather event itself. However, directing the reader to where one could go for further information would have been beneficial.

3.3 OCCURRING OVER MONTHS AND YEARS

Some high impact weather features are linked to processes that occur over seasonal or longer time scales, e.g. ENSO, Climate Change.

Because of the extremely protracted nature of events of this kind, NMHSs have plenty of time to develop and present the message very carefully. This is fortunate, because some of phenomena are very complex and have far-reaching effects, and it is therefore crucial that the information is communicated accurately and effectively.

Forecast information on seasonal scales is often statistically-based, and this adds an extra challenge to the communication process, since statistics (including probabilities) can be easily misunderstood or misrepresented. Examples of effective presentation of seasonal and longer-term forecasts are given below [1].

EXAMPLE 12: A climate outlook press release by the IGAD Climate Prediction and Applications Centre (ICPAC)

17th Climate Outlook Forum For the Greater Horn of Africa (GHA)
1 TO 3 MARCH 2006, NAIROBI, KENYA

Press Release (No Embargo)

The 17th Climate Outlook Forum for the Greater Horn of Africa (GHA) meeting in Nairobi Kenya from March 1-3, 2006 has issued an expert consensus seasonal climate outlook statement. The outlook derived from prediction models from ICPAC and other partner climate centres worldwide indicates increased likelihood of near-normal to below-normal rainfall over much of the Greater Horn of Africa during the March to May 2006.

The experts say many parts of the GHA have been experiencing severe drought conditions for many months with devastating impacts to many livelihood systems. Continued drought in these areas would have far reaching impacts if no proper intervention strategies are put in place. However they predict probabilities of near-normal to above-normal rainfall favour southern Sudan, central Ethiopia, western Uganda, parts of western, central and coastal Kenya, parts of Somalia coast, Lake Victoria basin of northern Tanzania together with south and south-western Tanzania; parts of Burundi and Rwanda. They noted that episodic intense wet spells and flash floods can occur even in areas with a likelihood of near to below normal rainfall.

Predictions by most climate centres, the summary statement says, indicate a transition from a mild La Niña to neutral conditions over the eastern and central equatorial Pacific Ocean during the forecast period. The current sea surface temperatures (SSTs) over much of Atlantic Ocean as well as south-western and eastern equatorial India Ocean are warmer than average. The north-western parts of the Indian Ocean is cooler than average.

During the forum, a tropical cyclone and a low pressure system developed in the south western Indian Ocean causing heavy rainfall over some parts of the equatorial sector. At the time of release of the consensus outlook, another cyclone developed in the western Indian Ocean but its projected track is unlikely to sustain the current heavy rainfall. The experts noted that further development of tropical cyclones in the south western Indian Ocean during March - May period could disrupt the rainfall patterns in the sub-region.

Update forecasts for the GHA countries will be provided by the National Meteorological and Hydrological Services (NMHS) and IGAD Climate Prediction and Applications Centre (ICPAC), Nairobi. The users are therefore strongly advised to keep in contact with their National Meteorological Services for interpretation of this outlook, finer details, updates and additional guidance.

Best practice

This a press release that was issued following a Climate Outlook Forum for the Greater Horn of Africa. It is very effective at describing:

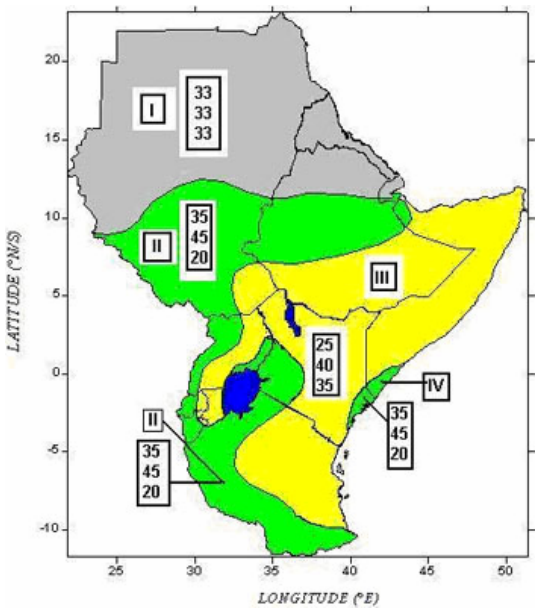
- Who has issued the release and who is affected by it
- What is expected in terms of seasonal conditions (near-normal to above-normal rainfall)
- Where the conditions will occur (southern Sudan, central Ethiopia, etc)
- Why and how the conditions will occur (phase of ENSO, SSTs, etc)
- How users can get more information

The long time-scale of seasonal events means that a formal press release can be a very effective means for disseminating information. When presented appropriately, with straightforward language, it is likely to be published in newspapers with little change, thereby ensuring the key messages are preserved.

[1] Some further discussion of statistical forecasts is also included in the section 'Confidence, Uncertainty and Alternative Scenarios'.

Because of the amount of detail contained in a press release of this kind, it is always a good idea to accompany it with explanatory information that will assist journalists and the general public to understand the background to the information. In the example press release presented here, detailed information, including statistical seasonal climate prediction maps were included (see below). In addition (but not shown here), maps and descriptions of the forage and food security outlooks were included in the release. Representatives of the disaster risk management, agriculture, livestock, and food security sectors participated in the development of these outlooks. This is an excellent example of the extensive coordination that can be achieved between affected stakeholders when dealing with these long-term events.

Greater Horn of Africa Consensus Climate Outlook for the Period March to May 2006



Zone I: Climatology is indicated over northern Sudan, northern Ethiopia, much of Eritrea and Djibouti.
Zone II: Increased likelihood of near-normal to above-normal rainfall over southern Sudan; central Ethiopia, southern Djibouti, western Uganda, Lake Victoria basin, Rwanda, Burundi, southern and south-western Tanzania and parts of northwest Somalia.
Zone III: Increased likelihood of near-normal to below-normal rainfall over much of Kenya; Central and north-eastern Tanzania; parts of central and south-eastern Uganda; much of Somalia and southern Ethiopia.
Zone IV: Increased likelihood of near-normal to above-normal rainfall over parts of Kenya and Somalia coasts.

Note: *The numbers for each zone indicate the probabilities (chances of occurrence) of rainfall in each of the three categories, above-, near-, and below-normal. The top number indicates the probability of rainfall occurring in the above-normal category; the middle number is for the near-normal and the bottom number for the below-normal category. For example, in case of southern and southwestern Tanzania (zone IV), there is 35% probability of rainfall occurring in the above-normal category; 45% probability of rainfall occurring in the near-normal category; and 20% probability of rainfall occurring in the below-normal category. It is emphasised that boundaries between zones should be considered as transition areas.*

Chapter 4
CONFIDENCE, UNCERTAINTY AND ALTERNATIVE SCENARIOS

Uncertainty is an inherent ingredient in the forecast process. Forecasters are very familiar with the question of uncertainty and predictability and must deal with it every time a forecast is formulated. Sometimes the available models or other guidance are consistent in their predictions and the forecaster is confident of the outcome. At other times, the models may differ greatly or the weather parameter may be intrinsically difficult to forecast; nevertheless, a forecast must be made, even when the confidence is low.

Users can obtain great benefit from knowledge of the uncertainty and confidence associated with a forecast.

Information about forecast uncertainty can be communicated in both quantitative and qualitative terms:

4.1 QUANTITATIVE TERMS

As an explicit number (e.g. Probability of Precipitation) or a range of numbers:

A worded scale (such as Low / Medium / High) may also be used which is defined according to specified probability ranges. Quantitative values of probability may also form the basis of more sophisticated forms of presentation such as tropical cyclone track prediction 'cones' that show forecast uncertainty as an envelop of possibility;

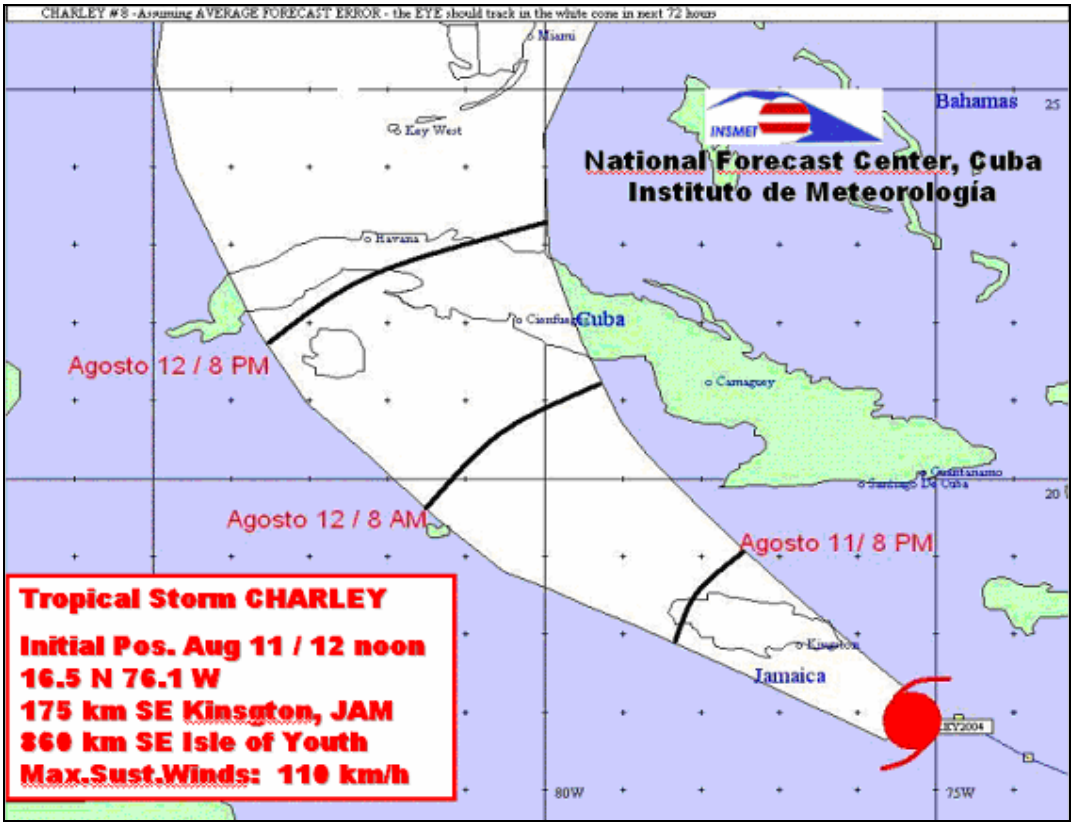
4.2 QUALITATIVE TERMS

Through speech:

Sometimes the most effective way to communicate uncertainty is descriptively through the spoken word. This allows the forecaster to elaborate on the situation and explain in qualitative terms the degree of uncertainty and the sources of this uncertainty (such as the various models not being in agreement). Although this approach is less useful for specialised users who make decisions based on specified probability thresholds, it can be quite helpful for advising the general public how much confidence to place in the forecast that is being made. It is also a useful approach for describing possible scenarios (e.g. "If that low pressure moves over there by midweek - and there is some chance of that happening - then that will bring a strong Northerly airflow over the country and we will see bright sunshine mixed in with some sharp showers"). Non-verbal cues such as body language, emphasis and tone of voice can also contribute to the effective communication of this information, although the effectiveness of this may vary from country to country and culture to culture.

A range of different formats are utilised for the presentation of forecast uncertainty and confidence information, from simple numbers and tables of probability values, to graphical maps and charts. The following examples show some of the 'best practice' methods available:

EXAMPLE 13: Projected path of a hurricane by Cuban National Forecast Centre



Best practice

This is a map showing the projected path of a hurricane in the Caribbean Sea, issued by the Cuban National Forecast Centre. The map shows the latest position of the hurricane together with an "error cone" that encompasses the possible future paths the hurricane may take.

This is an effective way of showing forecast track uncertainty.

The depiction of the forecast track as a cone ensures that the general public do not put too much emphasis on a single path and therefore assume they are safe if the path is not shown passing directly over them.

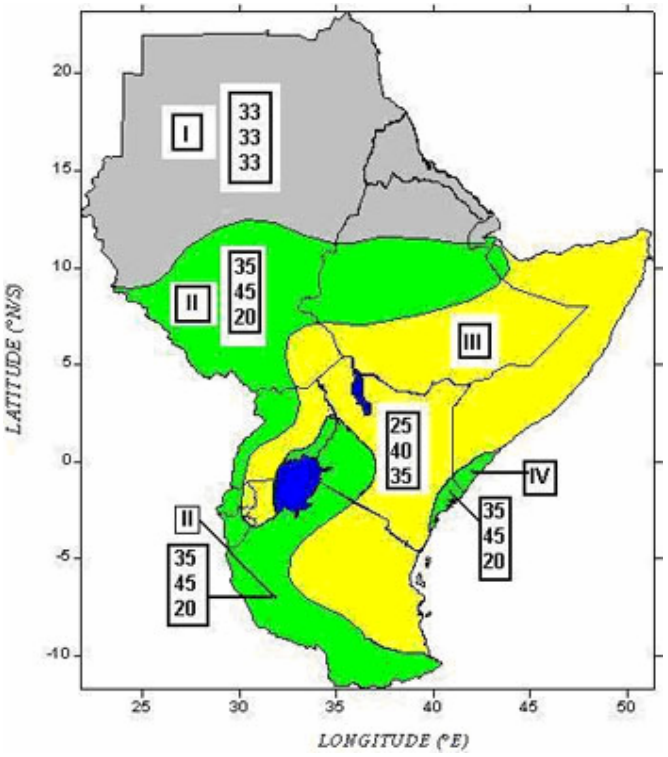
Also, this depiction reinforces the fact that, due to its size, a hurricane can affect a very large area and is not confined to a point or narrow swath.

The explanatory note at the top of the graphic is very important:

"Assuming AVERAGE FORECAST ERROR – the EYE should track in the white cone in next 72 hours".

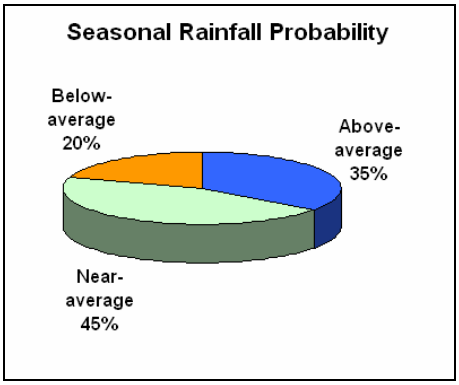
Without this explanation, users may be unsure whether the cone refers to the possible track of the hurricane centre, or represents the wind distribution, e.g. the extent of hurricane-force winds. These are quite different quantities and any misunderstanding may lead to significant problems in the response to the threat.

EXAMPLE 14: Communicating uncertainty information, ICPAC



Here again is the Greater Horn of Africa Consensus Climate Outlook which was shown in the previous section. It is included here as a good example of communicating uncertainty information.

For each region on the map, a seasonal forecast is provided in the form of a box containing three numbers. These numbers are the % probability of above-, near- and below-normal rainfall. The beauty of showing all three numbers together, is that all scenarios are described. In other words, it is made clear to users that although one particular outcome might be the most favoured, the alternatives are also possible. This message is very important in a risk-management context, and helps avoid the situation whereby an NMHS forecast of "greater than normal chance for above-average rainfall" (for example) is interpreted as a categorical forecast of above-average rainfall. An alternative, graphical representation of these probabilities could take the form of a pie chart:



4.3 ABOUT 50:50 PROBABILITIES

There can be times when there is no clear signal that suggests one particular weather or climate scenario is more likely than any other. For example, if a seasonal climate regime is dominated by the influences of the El Nino/La Nina, then during an inactive phase, confident predictions about above- or below- average conditions are not possible.

This can be a challenging situation to communicate effectively. For example, when NMHSs state that the chances of above average rainfall are 50:50, users often interpret this to mean that the NMHS is not prepared to make a prediction, is 'sitting on the fence', or is giving a forecast that is no better than the toss of a coin. In fact, there may be very strong meteorological reasons why the odds are 50:50, but it is a peculiarity of how this term is interpreted by the general public – it is, after all, the phrase used to describe the chance of a heads or a tails on a coin toss – that makes it so vulnerable to misunderstanding.

The situation can be made more difficult by the media's need to make every story interesting, and a 50:50 forecast, with no strong signals, is not a scenario that excites the imagination.

Finally, in using 'punchy' headlines to communicate the message in these situations,
care is needed to ensure that incorrect messages are not implied. Take the following opening of a press-release as an example:

50:50 chances for above average rainfall

The current seasonal rainfall odds do not strongly favour either wetter or drier than average conditions.

According to this message, the only options are 'above average' or 'below average' rainfall. Does the NMHS really intend to preclude the possibility of average rainfall? Probably not. Most NMHS will utilise percentiles, or similar parameters, to quantify seasons into ranges, with a percentile range of 40-60% (say) to define 'average'. With this in mind, a more accurate headline, and one that avoids the pitfalls described above, might be "Neutral odds for an average rainfall season".

Chapter 5
RADIO PRESENTATION

EXAMPLE 14: A sample radio broadcast

After today's mini heat wave, the rest of the week will be wet and windy. And tomorrow will be another unsettled day for many, with rain sweeping across the country from the west.

Now to southwest England, Wales, northwest England, Northern Ireland and southwest Scotland – tomorrow will start off dry but cloudy, with the cloud gradually increasing and thickening, accompanied by a freshening southerly wind. This weather will bring rain into these areas by lunchtime, and the rain will continue through the afternoon with some heavier bursts around, with a pretty wet evening rush hour. It will feel cool in the blustery wind, with a top temperature of 16 in Plymouth, and 17 in Bristol and Cardiff.

And for the next few days a good deal of cool and showery weather, particularly wet and windy on Wednesday and Thursday.

And that's the weather for the moment. I'm Jane Santos.

Best practice

Although this is a fictitious broadcast, it demonstrates many of the important aspects of an effective radio presentation:

- The style is easy-flowing and makes good use of colloquial language (e.g. "a pretty wet evening rush hour"). This personalises the presentation and allows the listener feel that they are being talked to, rather than talked at;
- Technical jargon is avoided which ensures that the listener understands what is being said;
- The presentation explicitly refers to the main times when listeners may be outside ("lunchtime", "rush hour"), which again, personalises the presentation and keeps it relevant;
- Good use is made of the opportunity that radio provides for qualifying the forecast ("a good deal of", "gradually increasing", "particularly"). This sort of nuance is much harder to communicate in other forms of presentation, such as written forecasts;
- The structure of the presentation is very good since:
  - A one-line introduction summarises the overall story;
  - The main body is focussed on the shorter-term forecast and is logically ordered by time of day into morning, afternoon then evening. (If there is significant geographical diversity to the forecast, the presenter should decide how to geographically structure the story and tie in various regions with relevant meteorological features. If possible, regions that can expect the same weather scenario should be grouped together. In order to group regions coherently, a good strategy for structure is to use the following questions: Where? What? When? Effect?)
  - A longer term outlook, with less precision than the short term forecast is provided. The reduced precision is a sensible reflection of the meteorological fact that forecasts become less accurate the greater the lead time. The outlook is punchy and highlights the main aspects – as the days draw closer, greater detail will be added. The broadcast is finished with a simple, personal sign off.