

# Development of a weather control indication chart

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**ABSTRACT.** A weather-control indication chart has been developed. Colour-steps indicate the synoptic weather at the sites of the weather-stations on the chart. This way a fast and synoptic geographic distribution of the zones of weather (ww), wind, temperature and visibility is obtained.

## 1. Introduction

In this paper, a new method of indication of synoptic weather with colour codes (as shown in Fig. 1 for controlling city traffic lights) using light emitting diodes is described. This method, called here a 'Weather Control Chart', was described in its early stage of development in earlier publications (Schulze-Neuhoff 1976 a & b, 1977, Tieman & Schulze-Neuhoff 1977). It has been completed and its prototype has been demonstrated already on 10 November 1977 in the current-affairs broadcast 'New knowledge' to the viewers of the Western-German TV III.

## 2. Review of current alternate systems

The weather-data coming in synoptically from the European weather station over telex in hourly or three-hourly intervals are in the form of :

IIiii Nddff VVwwW pppTT N<sub>1</sub>C<sub>1</sub>hC<sub>m</sub>Ch  
T<sub>d</sub>T<sub>d</sub>j<sub>a</sub>P<sub>a</sub>P<sub>a</sub> (7RRR<sub>e</sub> T<sub>e</sub> 911ff...)

or

IIiii Nddff VVwwW 8N<sub>s</sub>CH<sub>s</sub>h<sub>s</sub> OTTT<sub>d</sub>T<sub>d</sub>

and can be processed in 4 different ways :

- (1) on paper weather charts,
- (2) on TV-screens (video screens),
- (3) clip-boards, and/or
- (4) on wall indication panels.

On the paper weather charts the weather-data as station models are entered as shown in the following example :

Ch  
TT C<sub>m</sub> ppp  
VV ww N j<sub>a</sub>P<sub>a</sub>P<sub>a</sub>  
T<sub>d</sub>T<sub>d</sub> C<sub>1</sub>N<sub>h</sub> W

On account of the fact that these station models use much space on the chart, only a part of the weather station data at disposal can be plotted-in. Additionally, the editorial-desk deadline has to be awaited. In the case of a Europe chart, this delay can last upto half an hour.

The weather-data coming in on telex-tapes are being additionally clipped-on to a clip-board. However, listed serially these numerous data are difficult to survey and cannot be analysed within a short time. For this reason this clip-board should soon be a matter of the past and be replaced, e.g., by the following system which has been presented as a prototype by Oberstudienrat J. Hess of the Technische Hochschule at Aachen and the data-system Company DIHACO at Cologne. It is composed of the following hardware :

Telex punched-strip — punchstrip-reader —

micro-processor — approach-logic —

wall indication panel with indication elements.

Added to this is the controlling software-programme. The telex data received via punched-tape reader in the micro-processor listed serially are then being read-off by columns and represented on a wall indication panel showing the respective weather-element on the site of the associated weather station.

There are three possibilities of display for the indication elements :

- (i) The digit-display (Schulze-Neuhoff 1975c-Fig. 1) of small alpha-numerical characters: This has the advantage that hereby the separate weather-elements can be displayed as geographically distributed without gaps. The disadvantage is that

these data coded in digits have always to be translated in the first place and this takes time.

- (ii) The display by symbols, indicating the respective weather-symbol in place of digits, e. g., '=' for 'mist'. The AEG-Telefunken Company has developed an indication element which allows the display of additional 27 symbols besides the digits and letters, e. g., Shower- and thunderstorm-symbols  $\nabla$ , R→. The advantage: Immediately comprehensible display by means of easily remembered symbols, customary in meteorology. The disadvantage: It is the most expensive and time consuming of all three indication elements.

- (iii) The colour-display (discussed in this paper) as it has been employed for the prototype developed by us. Duo-Diodes (Light-emitting diodes of two colours—red and green) serve as indication elements in this case, optionally showing red or green in the same setting. Advantage: Low cost, effective and display using the least space.

Of course, telex-weather-data can be displayed as well on screens/data-video-displays. However, the advantage of the wall indication panel manifests itself by the fact that:

- (1) It can be made of any size you choose.
- (2) It is available for a larger audience.

(3) An additional advantage is afforded by the fact that the space between the indication-stations remains unoccupied so that, for instance, the largest part of the altitude-lines remains visible (If the right scale is selected, e.g., 1 : 1 million—1 : 500,000).

This is necessary because especially the low distance weather depends heavily on the orography (lee-side and weather-side effects) and on the ground-condition (e.g., mainly nocturnal radiation fog over marshes and river-plains).

Any geographical map with accurate orography, showing rivers and country-contours can, therefore, be used for a panel back-ground.

(4) Added to this is the low price of the Weather-Control Indication Chart. The systems, consisting of tape-reader, micro-processor, approach-logic and a Europe-chart with approximately 1000 Duo-diodes costs about DM 15,000-30,000.

(5) Possible effects of injury to health through continuous work (weather-control) at the video-screen by X-radiation are absent.

(6) In case of emergency the indication chart is much less susceptible to the possibilities of injuries such as from an exploding video-screen.

TABLE 1  
Total—clouds  
(here only 3 'colours')

| Colour Scheme   | Cloud amt. (octa) | Sky condition               |
|-----------------|-------------------|-----------------------------|
| Green permanent | 0-3               | Sunny or clear in the night |
| Red and green   | 4-6               | Sunny/cloudy                |
| Red permanent   | 7-8               | Overcast                    |

pt = permanent, sf = slowly flashing, ff = fast flashing

TABLE 2  
Wind speed (ff)

| Symbol | Colour scheme | Wind speed (kt) |
|--------|---------------|-----------------|
| pt     | Green         | 0-4             |
| sf     | Green         | 5-9             |
| ff     | Green         | 10-14           |
|        | Red/green     | 15-19           |
| pt     | Red           | 20-24           |
| sf     | Red           | 25-29           |
| ff     | Red           | 30 and more     |

TABLE 3  
Gusts (911 ff)

| Symbol | Colour scheme | Speed (kt)    |
|--------|---------------|---------------|
| pt     | Green         | 22-27 (Bf 6)  |
| sf     | Green         | 28-33 (Bf 7)  |
| ff     | Green         | 34-40 (Bf 8)  |
|        | Red/green     | 41-47 (Bf 9)  |
| pt     | Red           | 48-55 (Bf 10) |
| sf     | Red           | 56-63 (Bf 11) |
| ff     | Red           | 64 and more   |

### 3. Description of the system

The colour-display and its employment is further described below:

The Duo-diodes permit 7 well distinguishable displays, i.e., fast flashing red (ffr), slowly flashing red (sfr), permanent red (ptr), fast flashing green (ffg), slowly flashing green (sfg), permanent green (ptg) and red and green in alternation (rag).

By means of these 7 colour-codes it is possible to display the synop-code in colours, separated according to the different weather-elements, N,

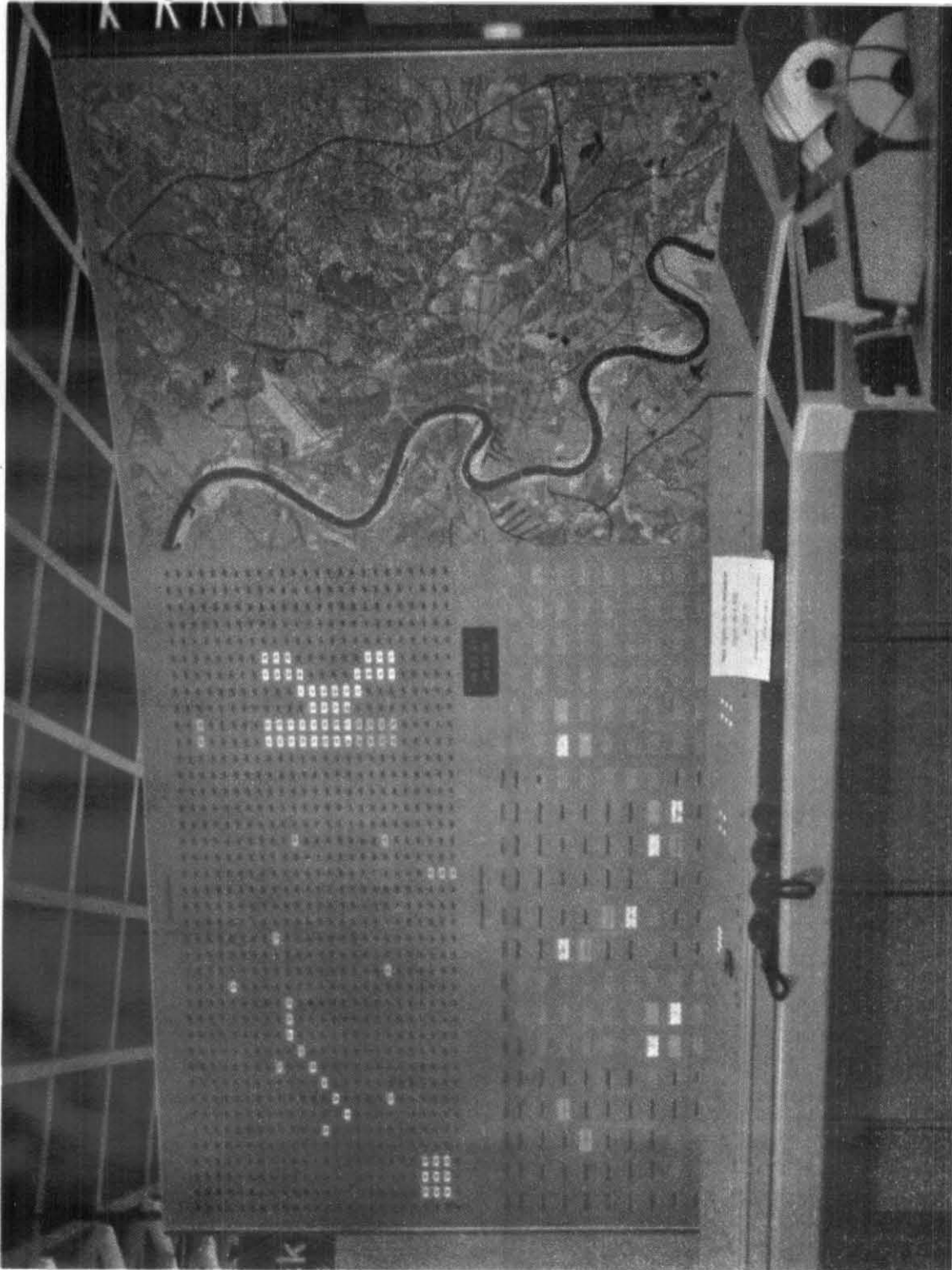


Fig. 1. Picture shows the type of a Control Indication chart, daily in use already since two years in D-4 Dusseldorf, to watch over all the traffic lights of the city. From the same type in the Weather Control Indication chart; Price  $\approx$  30000 DM in this form, the simple model 15000 DM only

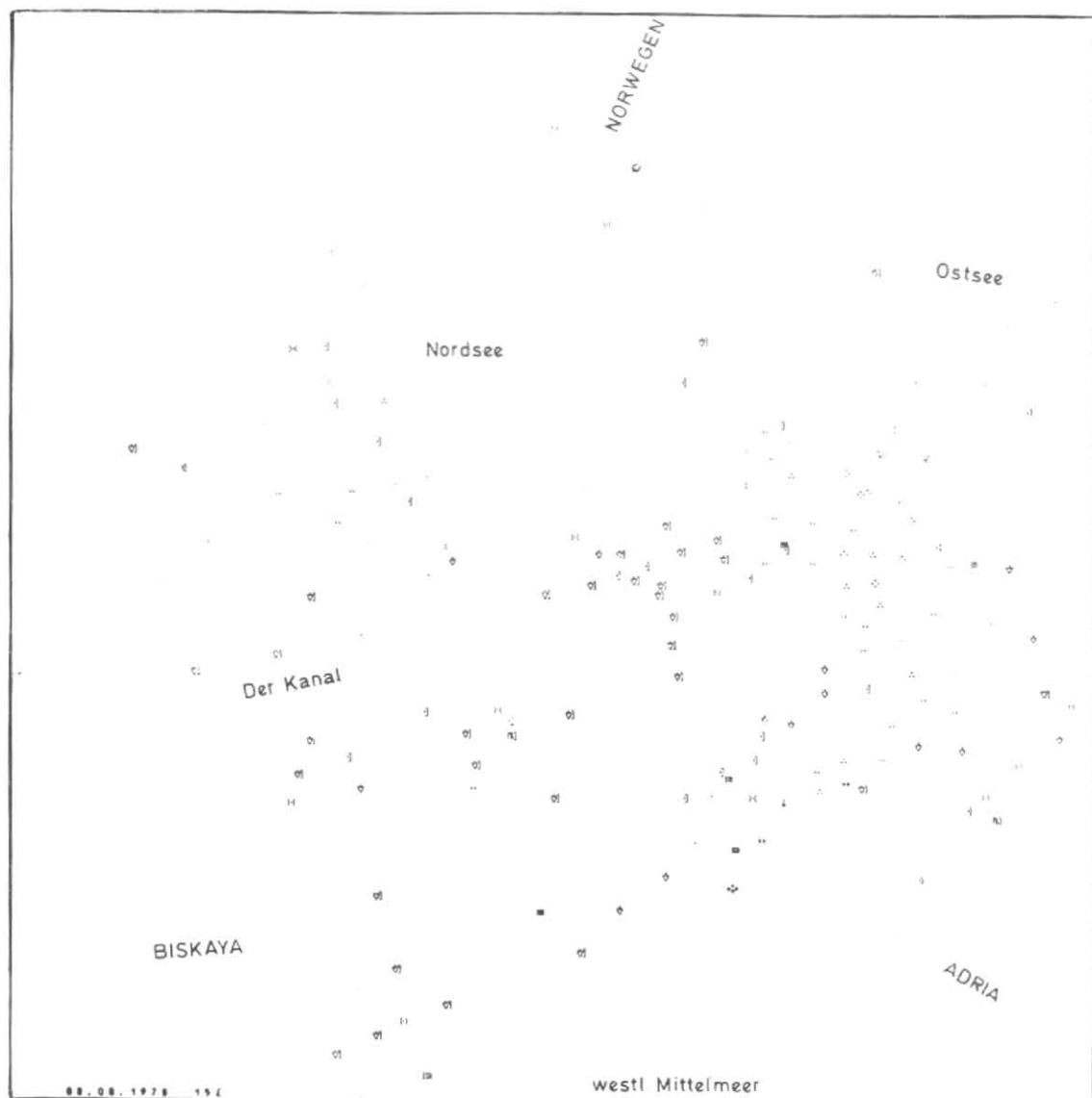
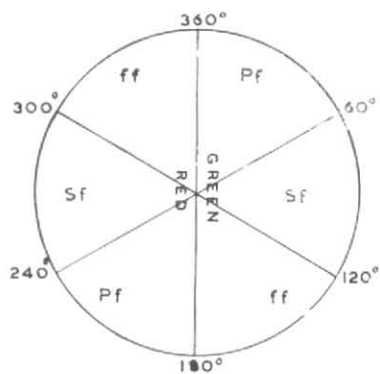


Fig. 2

TABLE 4  
Wind direction  
(here only 6 'colours')

| Symbol | Colour scheme | Wind    | direction |
|--------|---------------|---------|-----------|
| pf     | Green         | 00-60   | (NE)      |
| sf     | Green         | 70-120  | (E)       |
| ff     | Green         | 130-180 | (SE)      |
| pf     | Red           | 190-240 | (SW)      |
| sf     | Red           | 250-300 | (W)       |
| ff     | Red           | 310-360 | (NW)      |





dd, ff, VV, h, VV and chombinated, pp, T, T<sub>d</sub>, T<sub>max</sub>, T<sub>min</sub>, j<sub>a</sub>P<sub>a</sub>P<sub>a</sub>, RR, C<sub>t</sub>, C<sub>m</sub> and C<sub>h</sub>, gusts.

Tables 1-4 and Fig. 2 show the indication-possibility of N, dd, ff and gusts.

The next development will be to develop, apart from this, also a programme for the analyses of all available met. informations, of the readings- and observation-values supplied by the auxiliary observation stations and the automatic stations.

The colour-stage graduation for the 16 mentioned weather-elements can, of course, be modified according to requirements.

But for the single weather elements we can use the electronic plotter, mentioned by Schulze-Neuhoff (1976 a). An example of such a plotter-weather-chart over west and middle Europe is shown in the picture (Fig. 2). The signatures are the international synop-codes (ww=13-99).

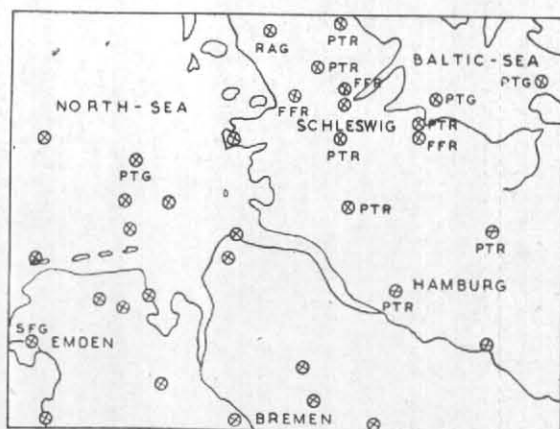
Our Weather Control Indication Chart should, therefore, be only for warning with switch I and II for survey.

#### Switch I for ww-warning

- (i) Fast flashing red (ffr) with acoustic signal for very great danger  
if ww = 13, 17, 29, 90-99 (thunderstorm)  
ww = 24, 56, 57, 66, 67, 79 (freezing rain/drizzle and ice pellets)  
ww = 27, 87-89 (soft hail and hail)
- (ii) Slowly flashing red for great danger (sfr) if ww = 52-55, 59, 62-65, 69, 72-75, 81, 82, 84, 86 and 48, 49 (moderate and severe precipitation and freezing fog).
- (iii) Permanent red, if VV = 00-09 and ww = 40-47 (ptr)
- (iv) Green and red (rag), if VV = 00-09 and ww = 50-99
- (v) Permanent green (ptg), if ww = 51, 58 or 61.
- (vi) Slowly flashing green (sfg), if ww = 14, 15, 16, 25, 26, 50, 60, 80.
- (vii) Fast flashing green (ffg), if ww = 68, 71, 83, 85.

#### Switch II for visibility and ceiling (Colourstate-warning) indication — Fig. 3) and wind

- (i) Permanent red (ptr) for colourstate red
- (ii) Fast flashing red (ffr) for colourstate amber



⊗ LOCATION OF THE METEOROLOGICAL STATIONS

Fig. 3. Schematic diagram showing distribution of LED-Lamps :

It shows the weather situation from 09-12-78 at 09 GMT over Northern Germany, indicated with Switch I;

- 3 Stations with ffr (freezing rain at that time);
- 9 Stations with ptr (fog);
- 3 Stations with ptg (ww=61);
- 1 Station (amden) with sfg (ww=60).
- (iii) Slowly flashing red (sfr) for colourstate yellow
- (iv) Permanent green (ptg) for colourstate green
- (v) Slowly flashing green (sfg) for colourstate white
- (vi) Fast flashing green (ffg) for colourstate blue and blue+
- (vii) Red and green (rag), if the middle wind above 25 and/or gusts above 35 knot.

In future, the industry will be able to offer Triple-diodes which can display the colours red, green and yellow in one setting (at present the colours green and yellow cannot be well distinguished on these diodes). In this way the colour-stage graduation could still be improved. In that yellow could be reserved for fog or mountainous country in clouds, as usual in meteorology. However, a too extensive increase is not desirable and not necessary either for weather-control, as this would lead to the loss of a good overall view. For greater differentiation the code or symbol display offers a possibility. On the whole, it may be mentioned that by means of this colour-display not all 16 weather-elements for each date should generally be called for, but only 2 or 3 most important out of this 'Programme-Library' which are of interest for the respective weather situation.

## 4. Concluding remarks

The application of the Weather-Control Indication chart is mainly necessary for the weather-control, on all airports and meteorological stations with a weather-counsel service, especially on small airports which have been so far predominantly informed only *via* telephone on the weather condition. Of course, apart from the aviation-weather counselling the navigation counselling has also to be mentioned. The chart is, apart from other purposes, also applicable for the display of ground-humidity in the region of the Federal German Republic or in the agricultural meteorology for the indication of the vegetation and blossoming stages. Additionally also for domains outside of meteorology, *e.g.*, for the police for the spot-displays of accident frequency by means of cipher or colour display (in place of pins).

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