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A Met/Ocean Wish List for Feature & Coverage Portrayal using SLD/SE

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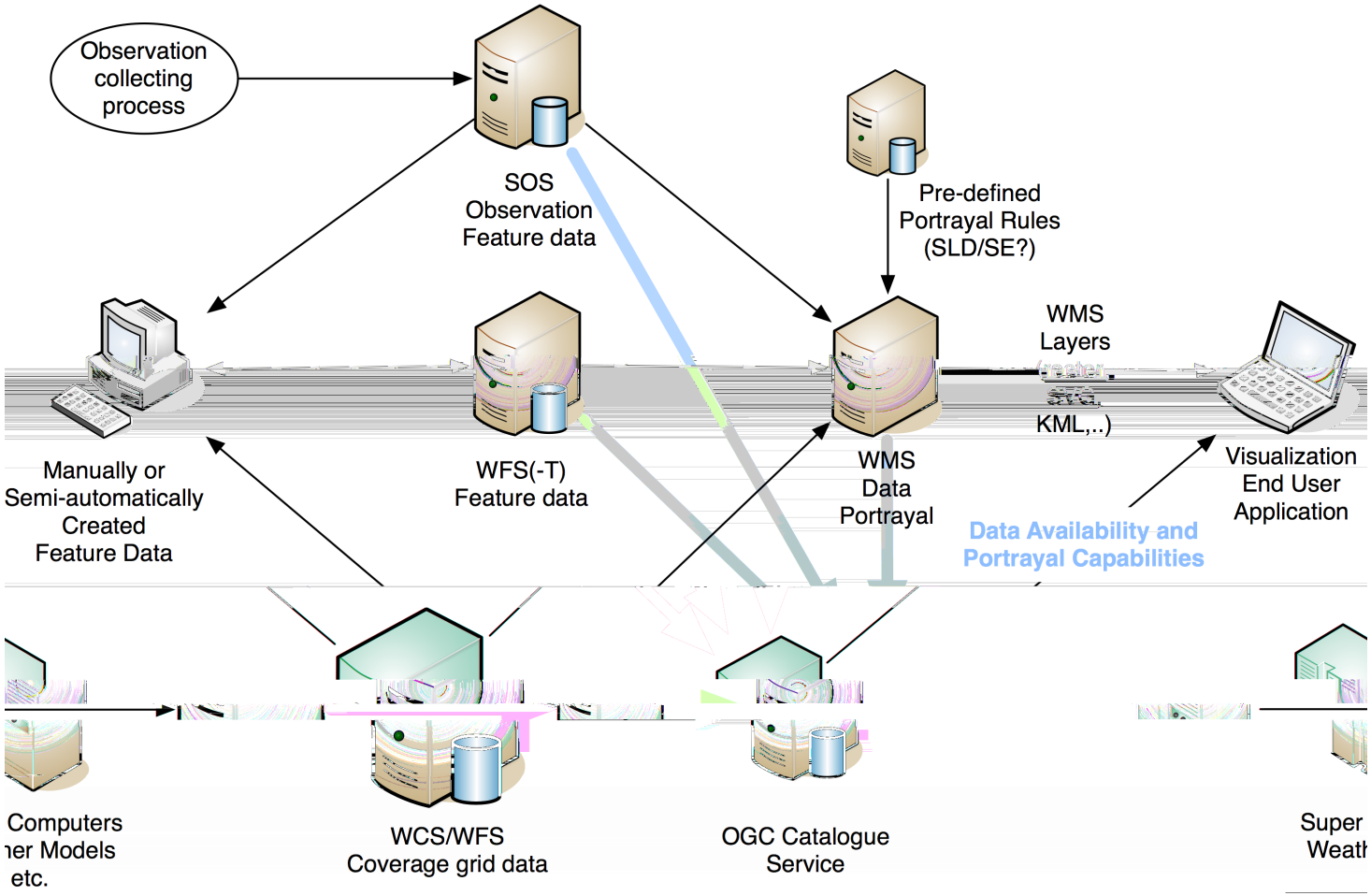
OGC SLDSE Standards Working Group Meeting
Frascati, Italy, 10th March 2010

Example Architectures

Component WMS model, Feature / Coverage Portrayal Service



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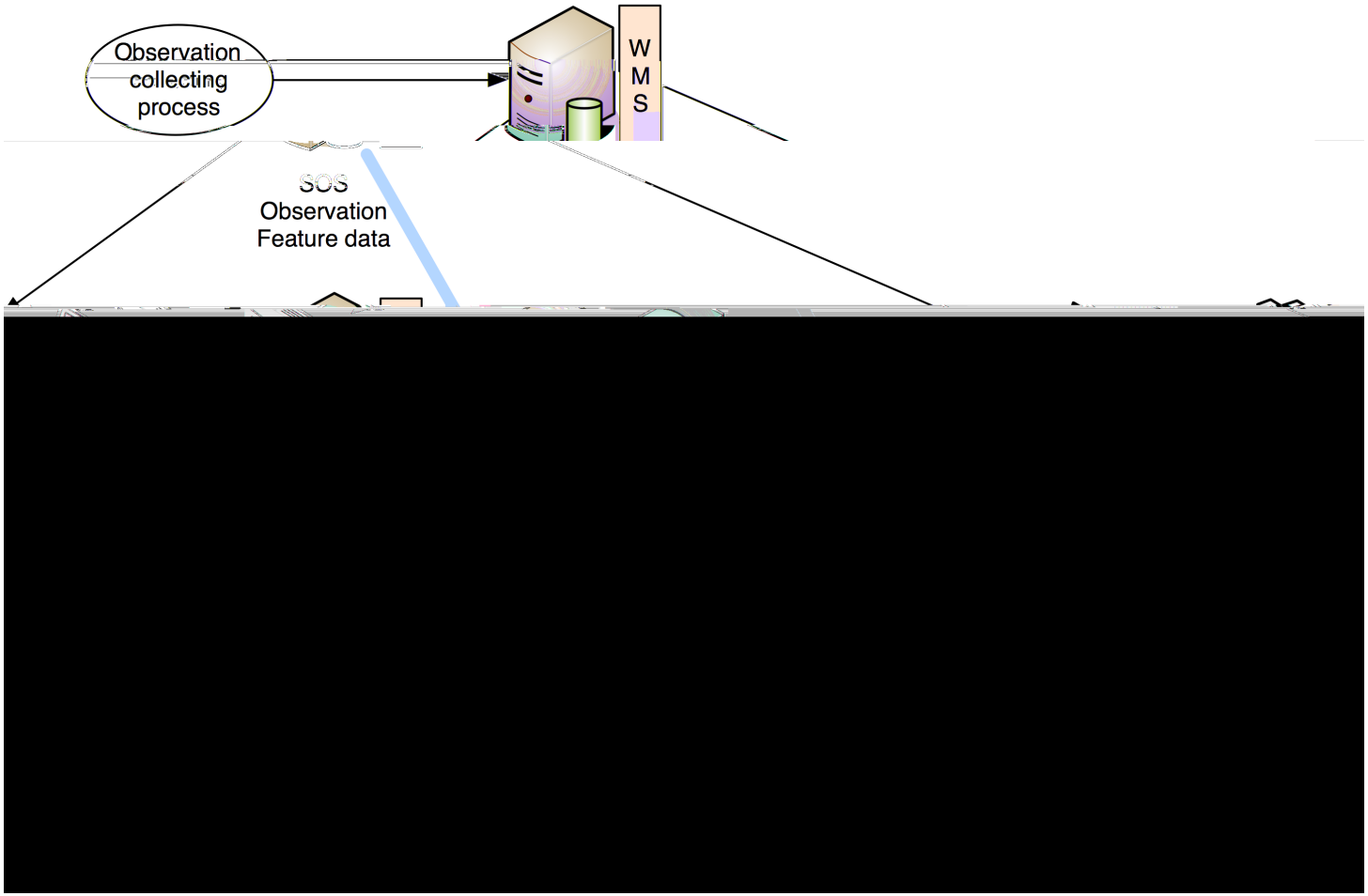
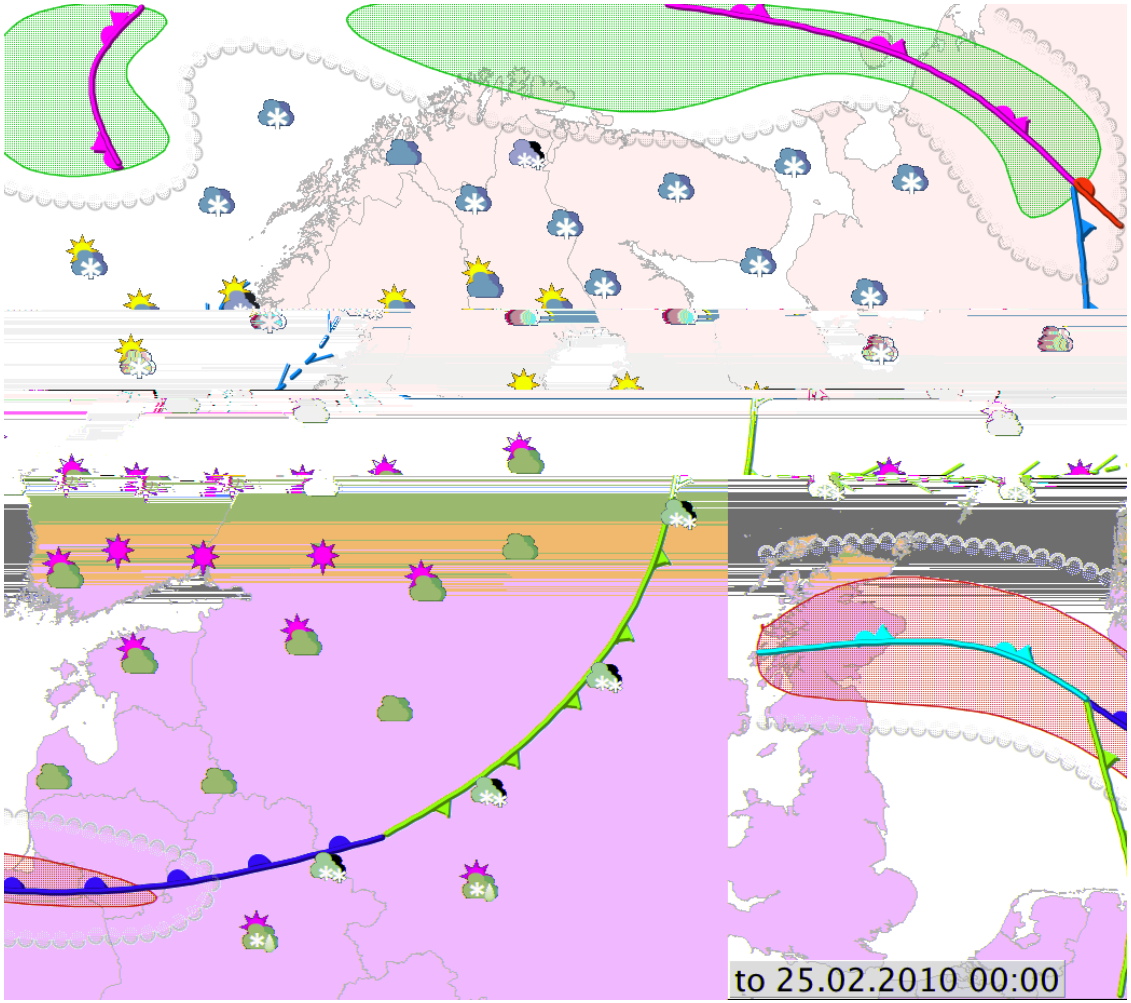


Meteorological Feature Data

- **Typically complex Features.**
- **Rapidly changing, often incomplete information.**
- **Internationally agreed, legally mandated visualization rules, but not in machine-readable format.**
- **Examples:**
  - weather observations from fixed or mobile observation stations,
  - Human-crafted weather forecasts or analyses,
  - (Semi-)Automatically extracted Features describing observed or predicted weather conditions or phenomena (like storms).

Features, (Relatively) Simple Cases

- **Image symbols, decorated lines, areas with color and/or hatch fill.**
- **BUT lines (and decorations) have direction, arrow heads.**
- **Line and area geometries may be defined with spline curves and rings.**



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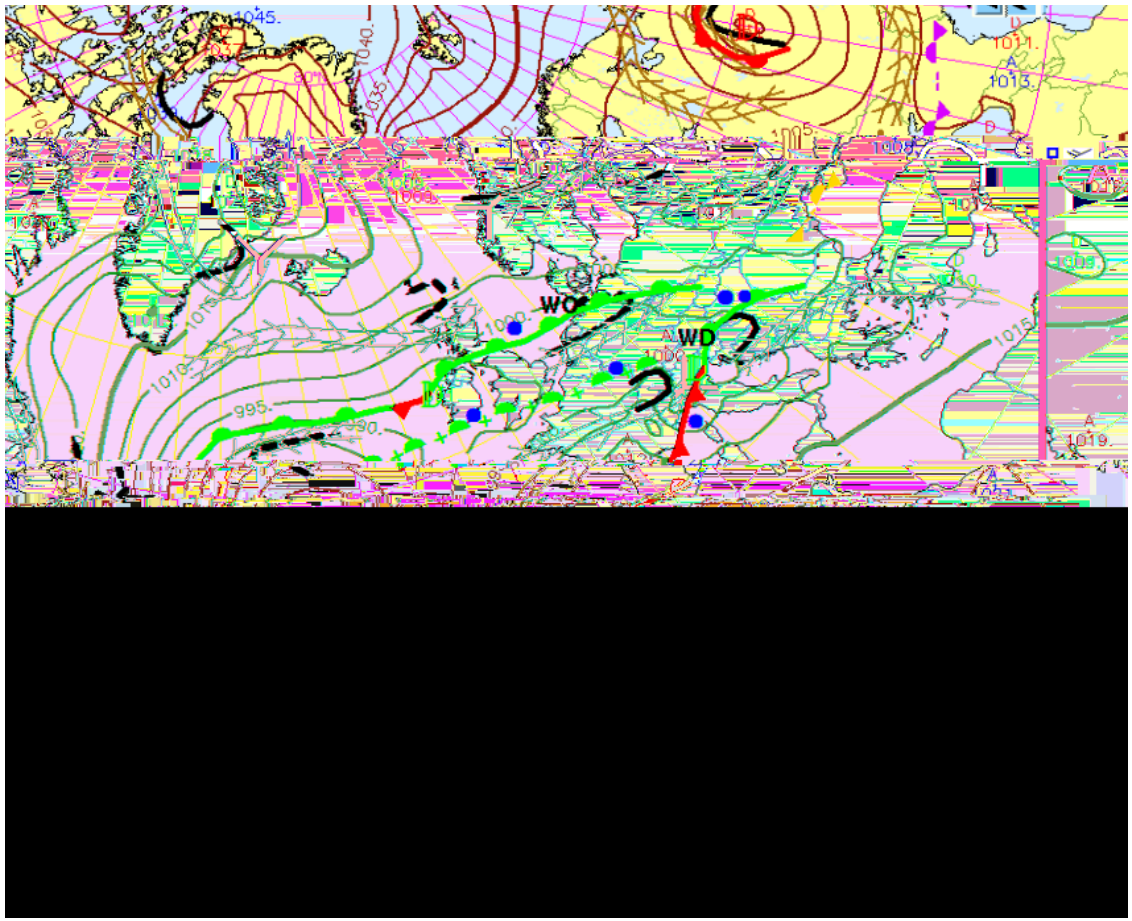
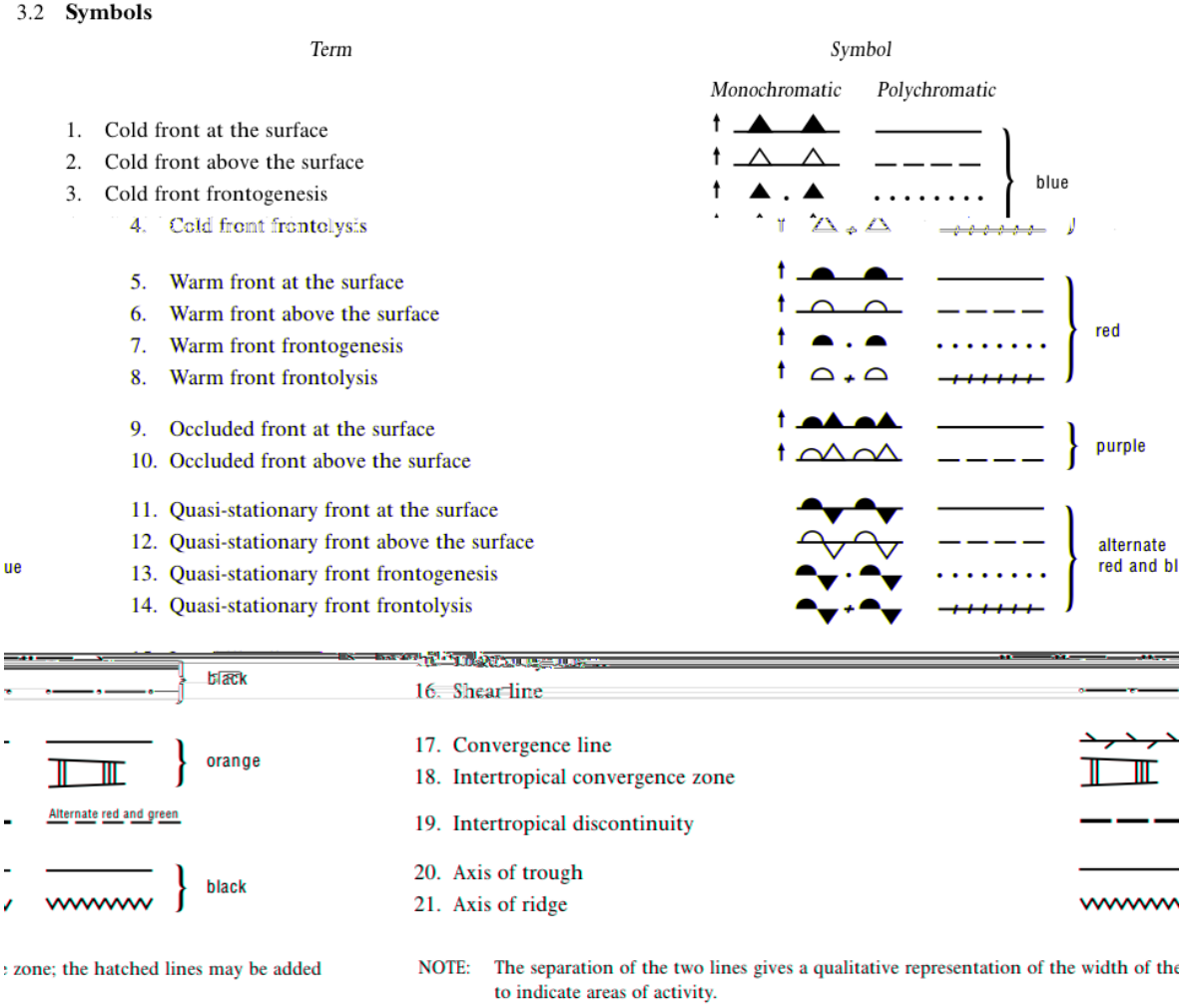


Symbology Is Mandated for WMO Members

WMO Manual on the Global Data-Processing and Forecasting System, Part II, Appendix II-4



3.2 **Symbols**

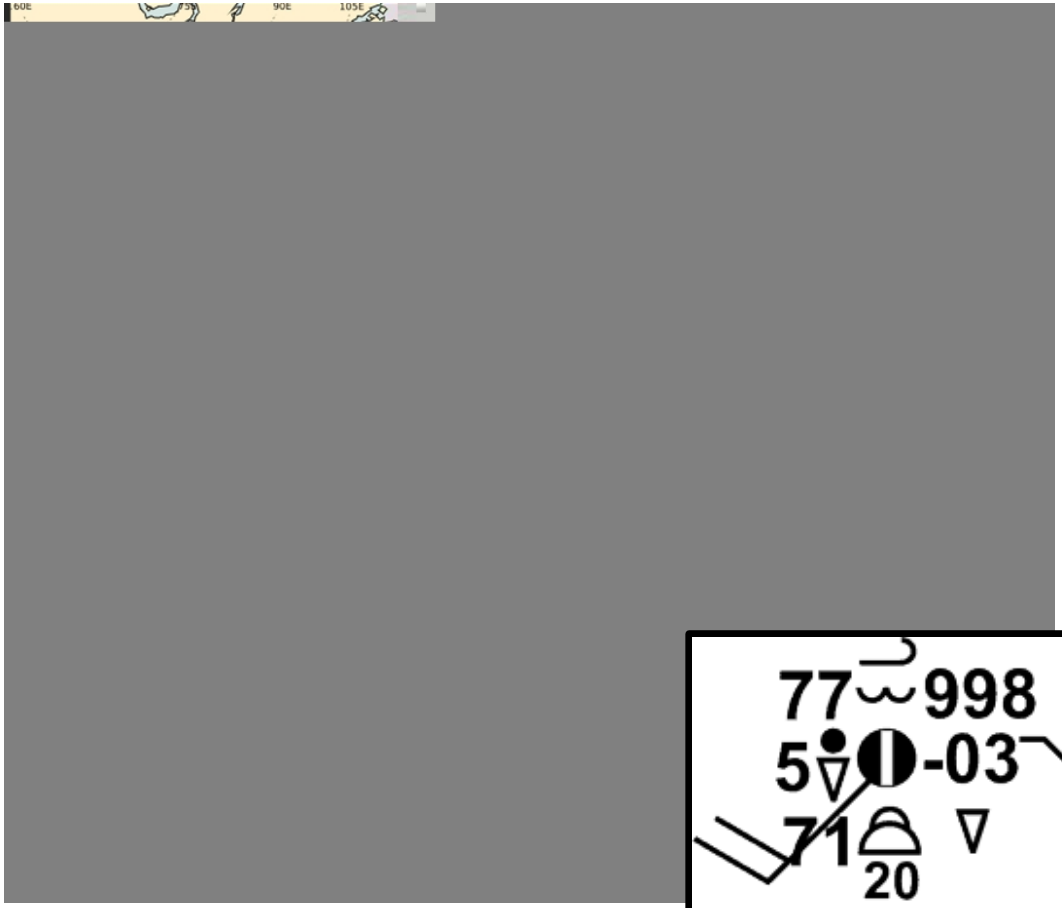
Term	Symbol	
	Monochromatic	*Polychromatic*
1. Cold front at the surface	▲	—
2. Cold front above the surface	△	– – – –
3. Cold front frontogenesis	▲ . ▲	. . . . .
4. Cold front frontolysis	△ + △	— + — + —
		blue
5. Warm front at the surface	◠	—
6. Warm front above the surface	◠	– – – –
7. Warm front frontogenesis	◠ . ◠	. . . . .
8. Warm front frontolysis	◠ + ◠	— + — + —
		red
9. Occluded front at the surface	▲◠	—
10. Occluded front above the surface	△◠	– – – –
		purple
11. Quasi-stationary front at the surface	▼◠	—
12. Quasi-stationary front above the surface	▽◠	– – – –
13. Quasi-stationary front frontogenesis	▼◠ . ▼◠	. . . . .
14. Quasi-stationary front frontolysis	▼◠ + ▼◠	— + — + —
		alternate red and bl
ue		
		black
16. Shear line		
		orange
17. Convergence line		
18. Intertropical convergence zone		
		Alternate red and green
19. Intertropical discontinuity		
		black
20. Axis of trough		
21. Axis of ridge		

: zone; the hatched lines may be added

NOTE: The separation of the two lines gives a qualitative representation of the width of the to indicate areas of activity.

Features, More Challenging(?) Cases

- **Synop (gound weather observation) plots**
- **Several observation parameters combined in fixed positions around the observation position.**
- **Both graphical and text notation.**
- **Data probably some kind of O&M via an SOS/WFS interface.**



Typical station weather plot

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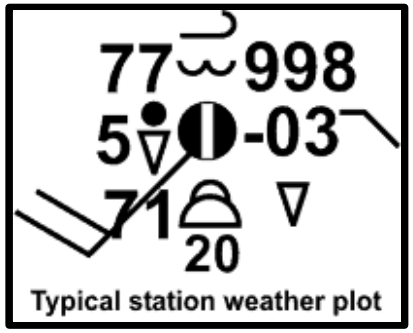

Typical station weather plot

APPENDIX II-4

GRAPHICAL REPRESENTATION OF DATA, ANALYSES AND FORECASTS

1. **THE SURFACE PLOTTING MODEL**

If it is required to plot the elements shown in the model, they should be placed in the relative positions shown. Any of the elements may be omitted.

T_gT_g	$T_xT_xT_x$ or $T_nT_nT_n$	C_H	E or E'sss	
	TTT	C_M	PPPP/$P_oP_oP_oP_o$ or $a_3$hhh/ $P_oP_oP_oP_o$	
V V	ww/W_1W_1 or W_aW_a/W_1W_1	N	PPP	a
	$T_dT_dT_d$	C_LN_h h or hh	W_1W_2/w_1w_1 or $W_{a1}W_{a2}$/W_1W_1	GG or GGgg
	$T_wT_wT_w$	$P_{wa}P_{wa}H_{wa}H_{wa}$ or $P_wP_wH_wH_w$	RRR/t_R D_sv_s	

$d_{w1}d_{w1}P_{w1}P_{w1}H_{w1}H_{w1}$

$d_{w2}d_{w2}P_{w2}P_{w2}H_{w2}H_{w2}$

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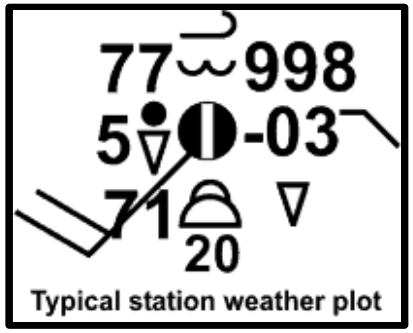

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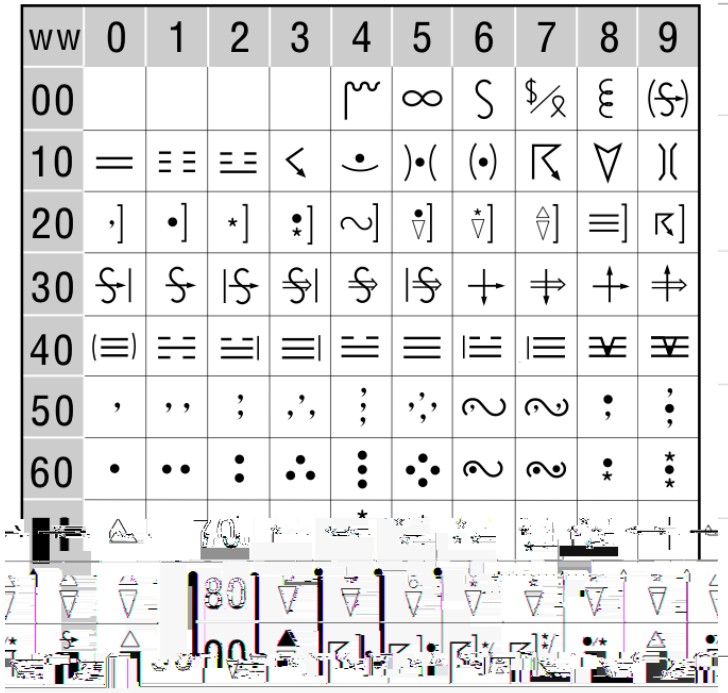

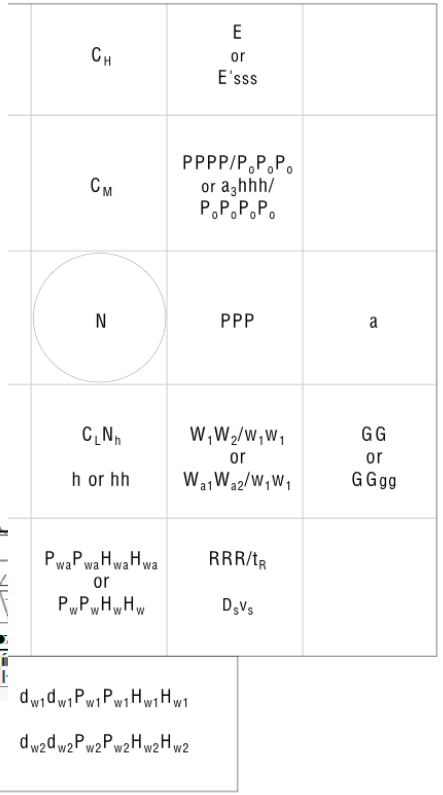

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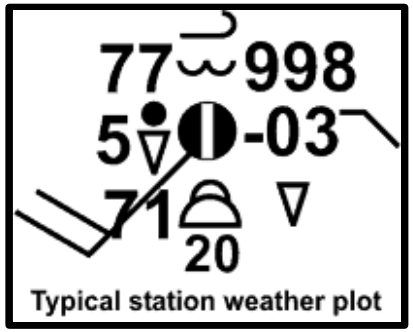

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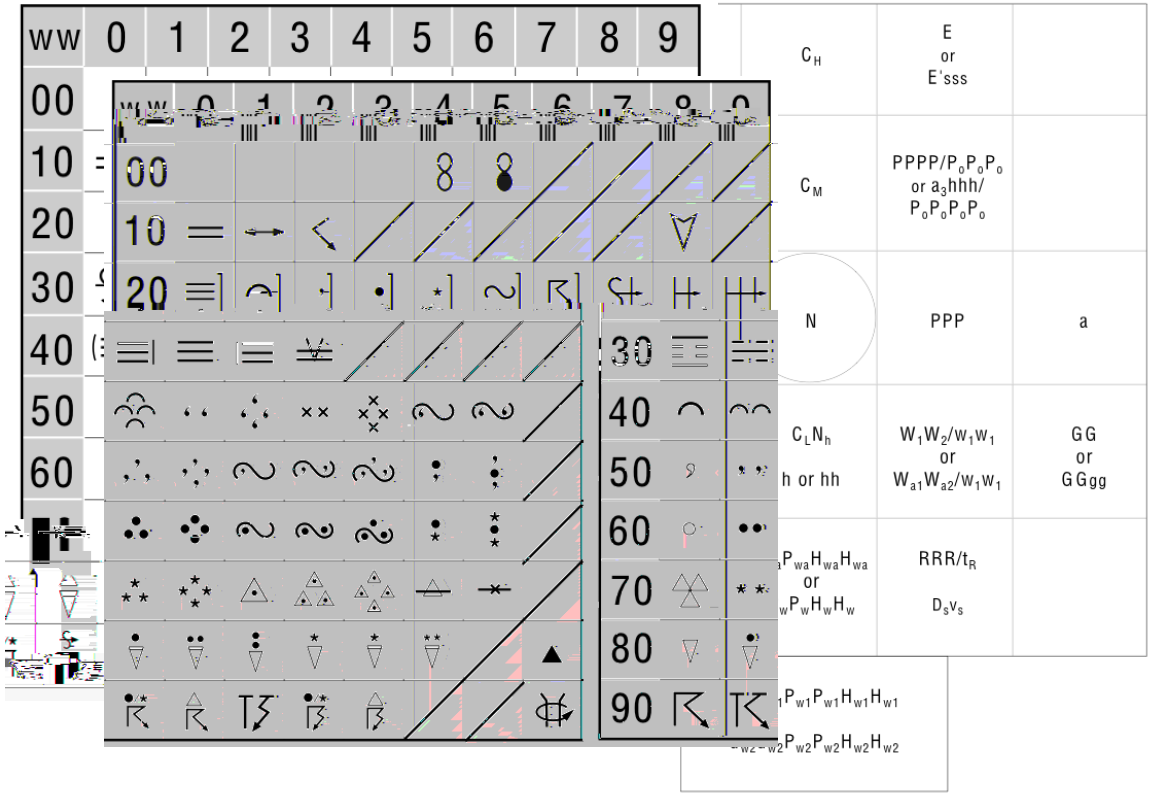

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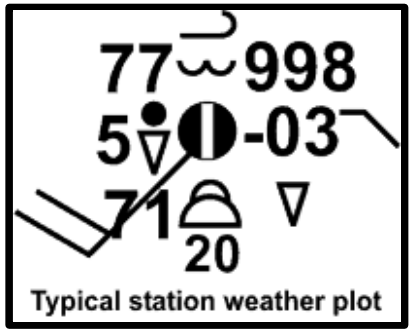

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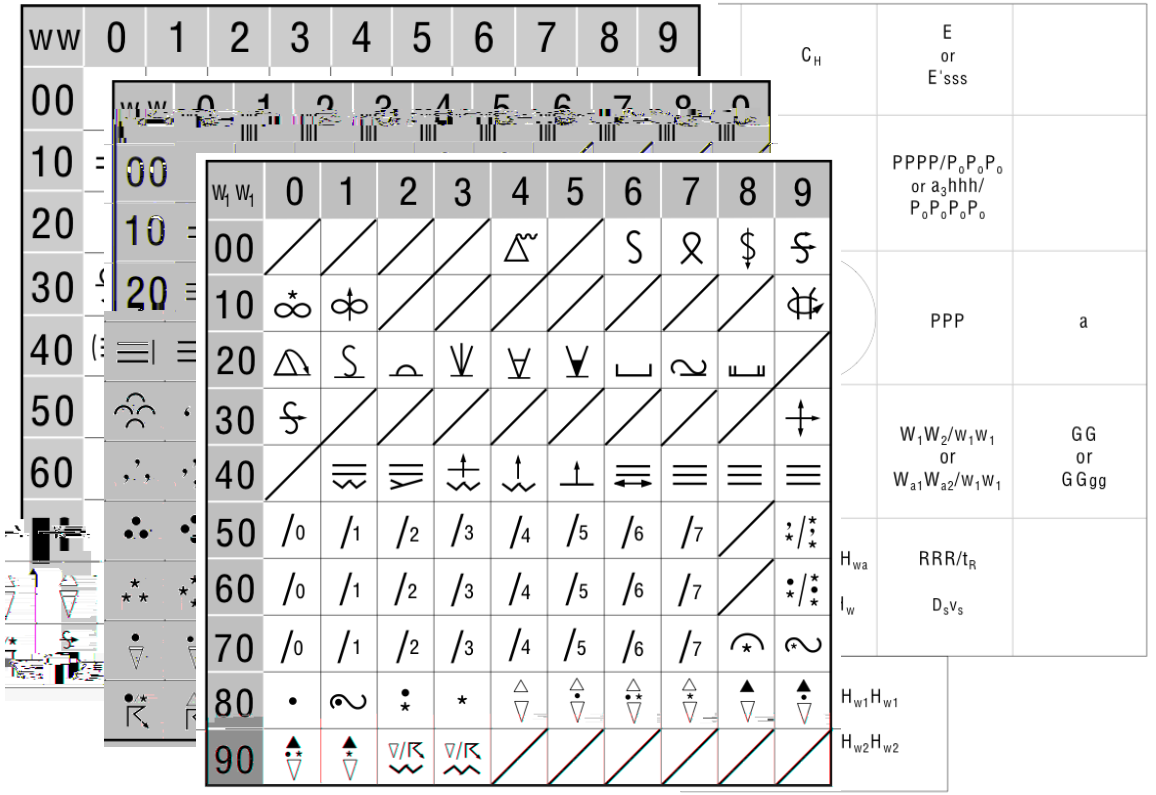

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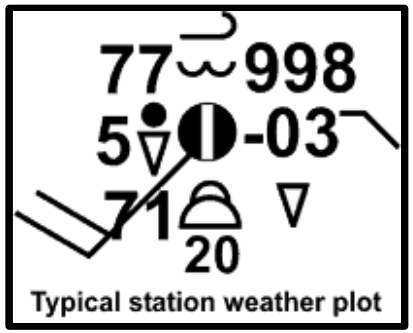

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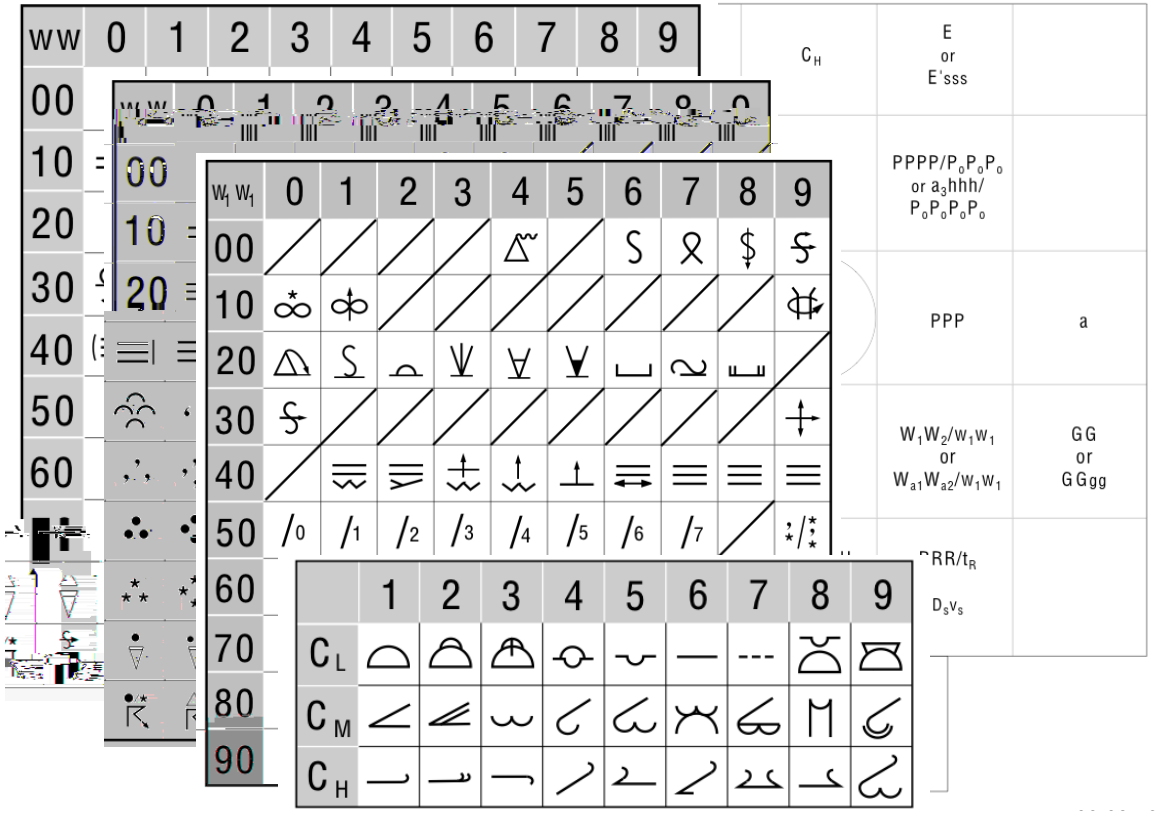

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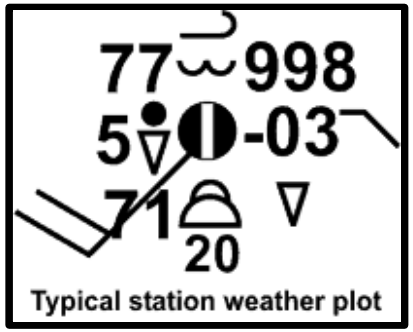

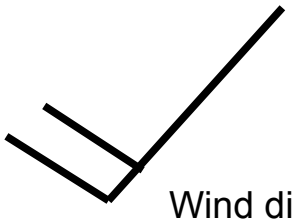

Wind direction and strength

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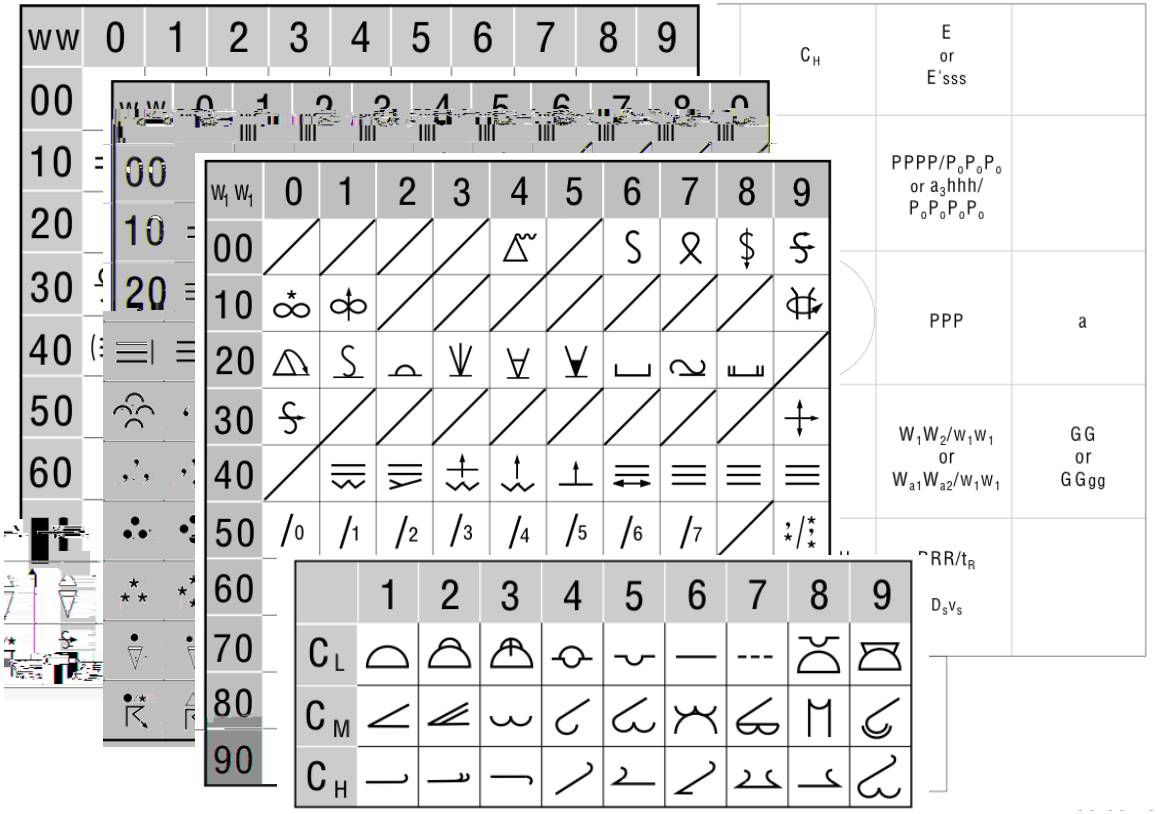


Features, More Challenging(?) Cases

- **Significant Weather Charts (SigWx, SWC)**
- **Detached labeling**
- **Features may contain additional geospatial structure: wind speeds at specific points and heights along the jet lines.**

Features, More Challenging(?) Cases

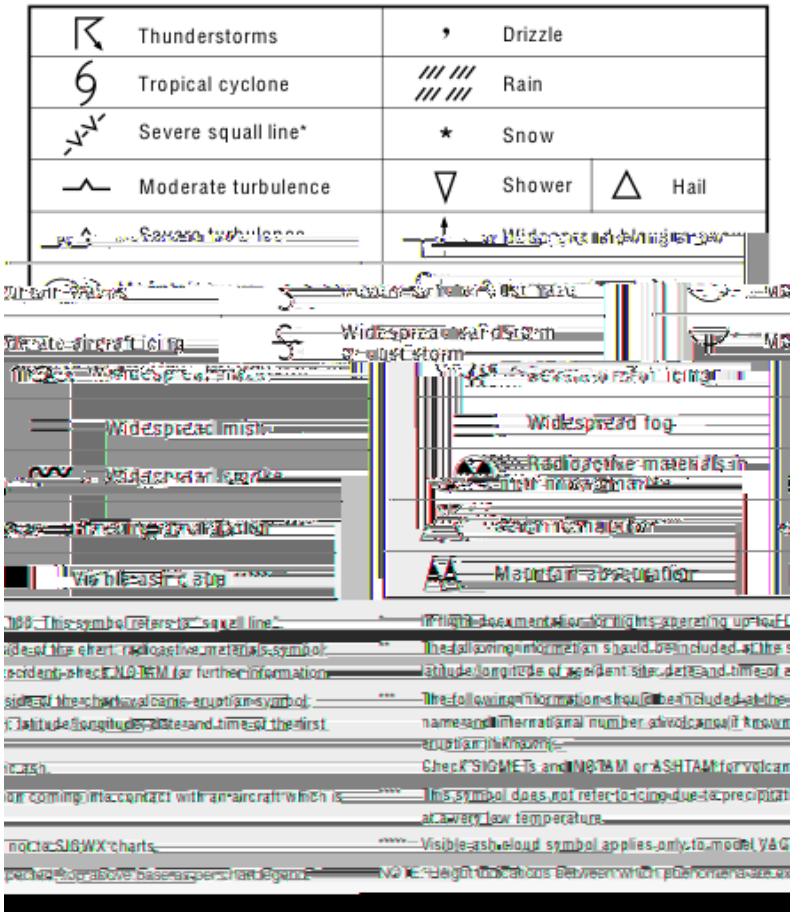
- **Significant Weather Charts (SigWx, SWC)**
- **Detached labeling**
- **Features may contain additional geospatial structure: wind speeds at specific points and heights along the jet lines.**

Wind arrows indicate the maximum wind in jet and the flight level at which it occurs. Significant changes (speed of 20 knots or more, 3 000 ft (less if practicable) in flight level) are marked by the double bar. In the example, at the double bar the wind speed is 225 km/h (120 kt).

The heavy line delineating the jet axis begins/ends at the points where a wind speed of 150 km/h (80 kt) is forecast.

Legally Mandated Symbology, Aviation Met

1. Symbols for significant weather



WMO Technical Regulations, Volume II, Meteorological Service for International Air Navigation, Chapter 3.1, Appendix 1-16

Originates from the “Chicago Convention”, Annex 3

2. Fronts and convergence zones and other symbols used

Cold front at the surface		FL 270	Position, speed and level of max. wind
Warm front at the surface			Convergence line
Occluded front at the surface		0°:100	Freezing level
Quasi-stationary front at the surface			Intertropical convergence zone
H 460	Tropopause High	10	State of the sea
270 L	Tropopause Low	18	Sea-surface temperature
380	Tropopause Level	40	Widespread Strong surface wind *

FL 300 — FL 340

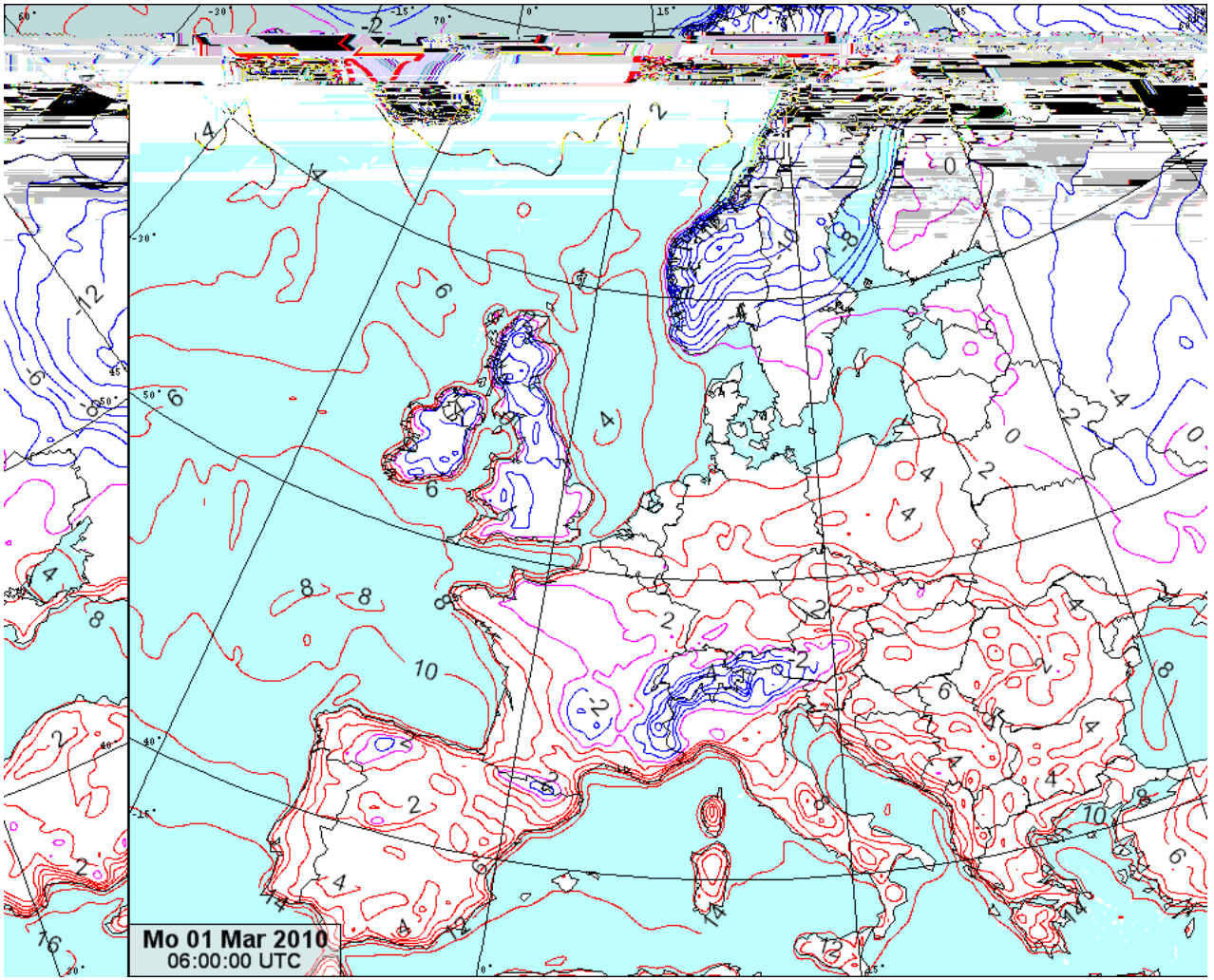
Wind arrows indicate the maximum wind in jet and the flight level at which it occurs. Significant changes (speed of 20 knots or more, 3 000 ft (less if practicable) in flight level) are marked by the double bar. In the example, at the double bar the wind speed is 225 km/h (120 kt).

The heavy line delineating the jet axis begins/ends at the points where a wind speed of 150 km/h (80 kt) is forecast.

* This symbol refers to widespread surface wind speeds exceeding 60 km/h (30 kt)

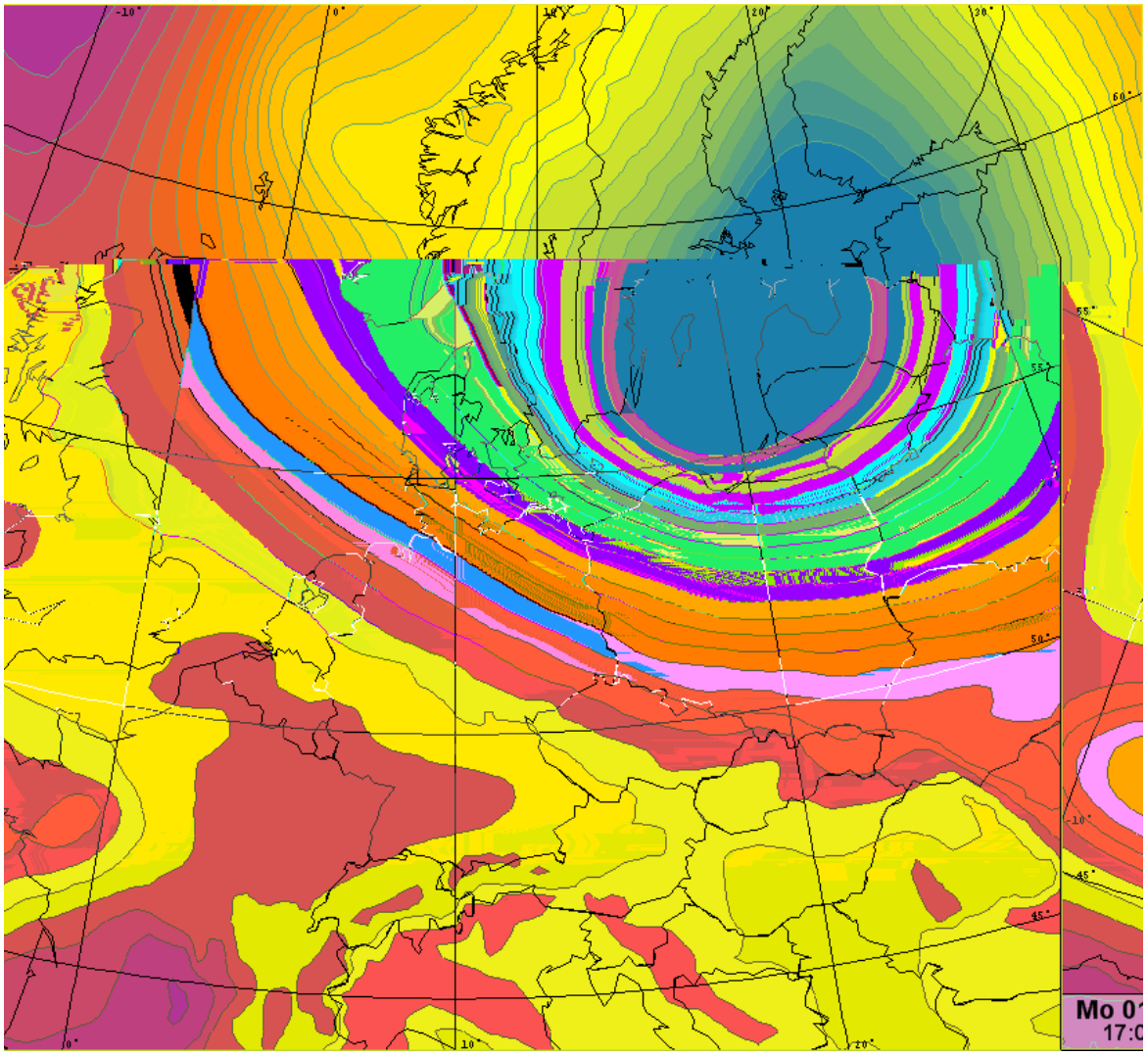
Coverage Portrayal Needs: Isolines

- **Line density definable.**
- **Coloring depending on the data ranges.**
- **“Smart” labels positioning along the isolines.**
- **Highlight the major isolines by increased line weight**



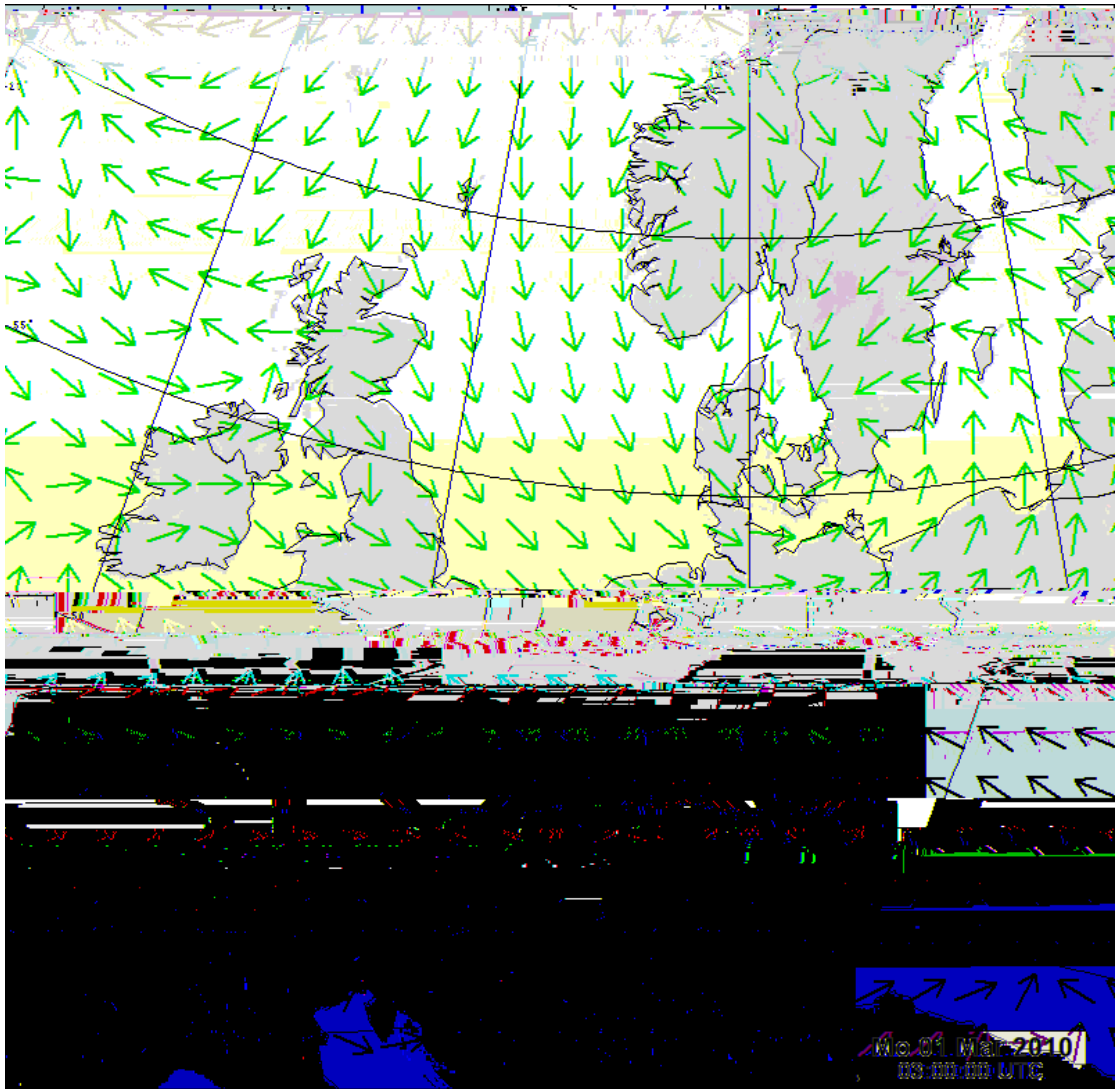
Coverage Portrayal Needs: Contour Lines

- **Color slides, several ranges depending on the data values.**
- **Possibly special ranges around the most interesting values (like temperature around zero)**
- **Some ranges may be transparent**



Coverage Portrayal Needs: Wind Arrows

- **Line properties (size, weight) may depend on the data values.**
- **The visualization may depend on several parameters (wind speed, direction, others)**



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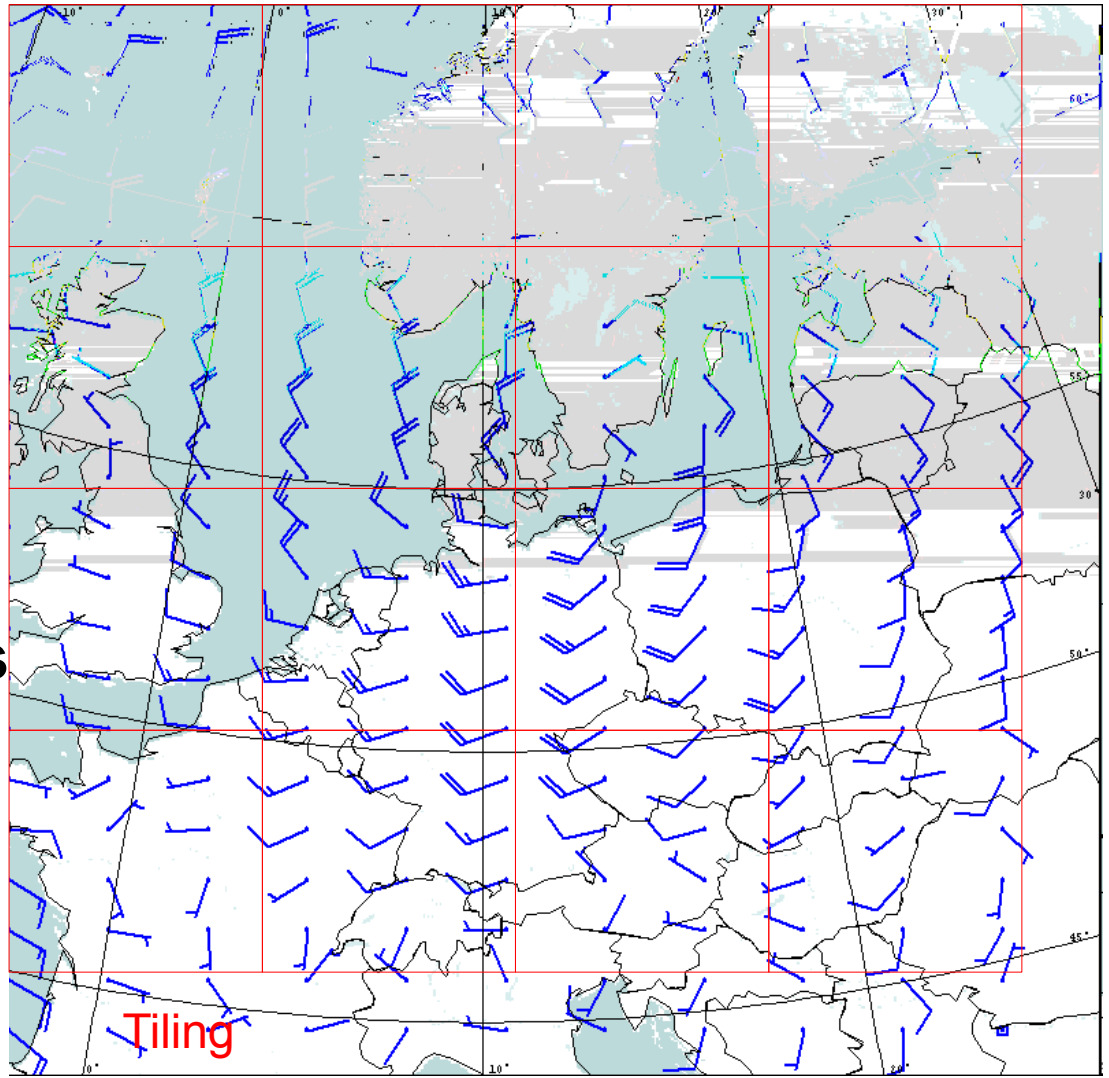
Coverage Portrayal Needs: Wind Barbs

- **Line properties (size, weight) may depend on the data values.**
- **The visualization may depend on several parameters (wind speed, direction, others)**
- **Different handedness depending on the hemisphere**
- **Difficulties in tiling (WMTS)**



Avoid Cluttering, Adjust The Level Of Detail

- **Existing in SE: maxScaleDenominator and minScaleDenominator in se:RuleType.**
- **But we also need to be able to**
  - visualize the coverage data with different sampling on different map (zoom) scales.
    - WCPS?
  - calculate the categorization (for isolines) based on the map scale.

Our Hopes for the SLD/SE

- **Language for formalizing the existing internationally agreed symbology and data visualization rules.**
  - Especially important for using the Met/Ocean data in non-met/ocean visualization software together with data from other domains.
  - Necessity for providing the data to non-experts in non-graphical formats (GML, binary grid formats).
- **A clean separation of visualization from the data in format that can be shared and re-used.**