Validation of PGE 10 Automatic Satellite Image Interpretation

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Synopsis

- **Validation Dataset**
- **Validation Rules**
- **Evaluation of ASII**
- **Evaluation of ASIINWP**

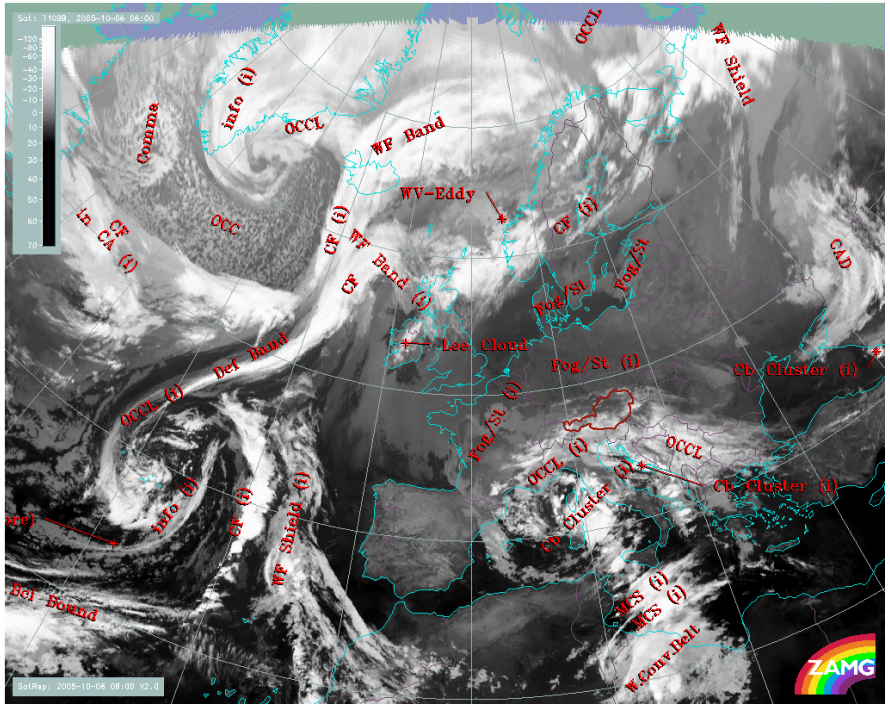
Evaluation of PGE10: Validation Dataset

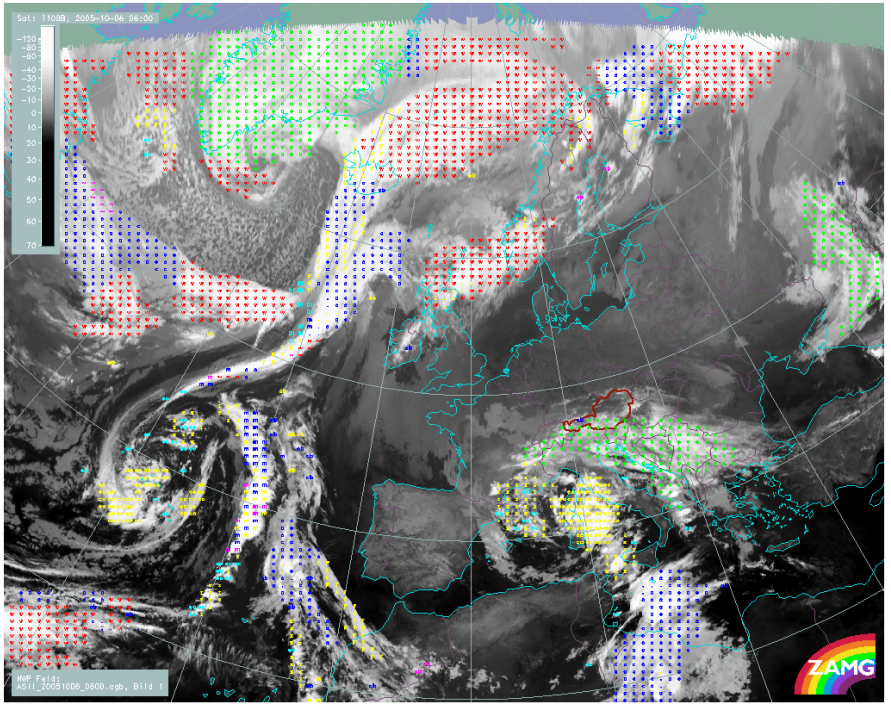
- **Evaluation phase from 16th February to 30th September 2005**
  - **winter period (16th Feb. – 15th April 2005)**
  - **summer period (18th April – 30th September 2005)**
- **Separate evaluation of ASII and ASIINWP**
- **Evaluation of PGE10 against the SATREP twice a day (06 UTC and 12 UTC)**

Validation Rules

- **The manually generated SATREP served as reference to both PGE10 outputs.**
- **Conceptual Models from the SATREP were compared to analysed areas in PGE10.**

Comparison PGE10 with SATREP





Evaluation of PGE10

The four ratings used to describe the quality of PGE10 output:

Rating	**1**	**2**	**3**	**4**
Meaning	correct	partly correct	not correct	Hardly/not analysed
Percentage correctly analysed	> 66%	50 – 66%	0 – 50%	

An additional quantification of the occurrence of incorrect CM analyses was done with the following adjectives:

Adjectives	**Mostly**	**Many**	**Some**	**Few**	**mixed**
Percentage	> 66%	33 – 66%	5 – 33%	< 5%	2 CM with 50%

Re-grouping of frontal categories

PGE10 analysis	SATREP analysis
Cold Front	Classical CF CF in CA CF in WA Arctic CF Split Front BB Occlusion CAD
Warm Front	WF band WF shield Detached WF
Occlusion	Classical Occlusion Occl. CCB Occl. 2nd Low Instant Occl.

Table 2: Assignment of frontal SATREP categories to PGE10 classifications

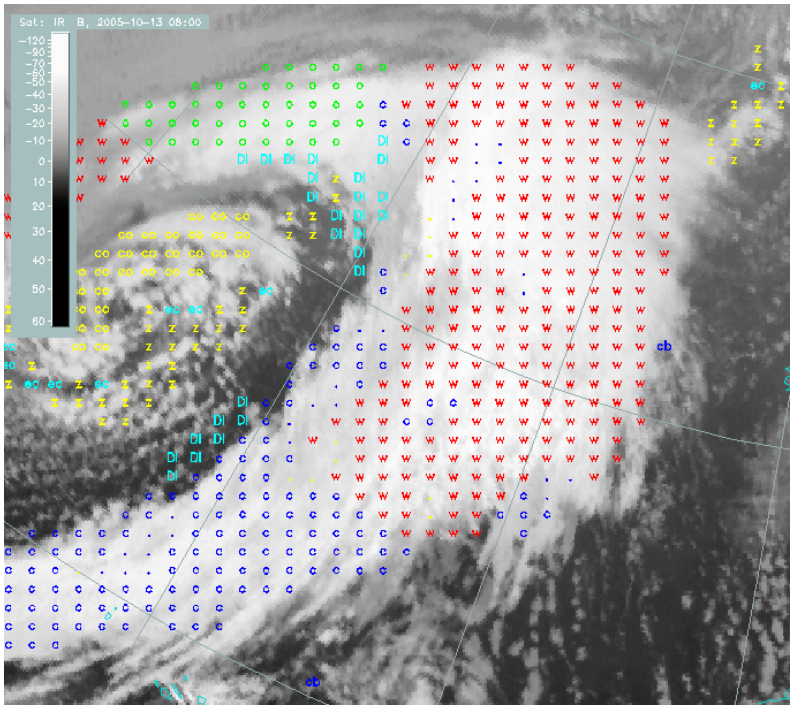
ASII: Overall performance

All WF:	**50.5%**
All CF:	**49%**
MCS:	**46.5%**
EC:	**40.5%**
CB Cluster:	**40%**
All Occl.:	**39.5%**
ECAC:	**37.5%**
Comma:	**27%**
Frontal Waves:	**25.5%**
Lee Clouds:	**21%**
CCC:	**16%**
CAC:	**15%**
Jet Fibres:	**9.5%**

Evaluation of ASII: Frontal Categories

Cold fronts:

- Almost 50% of all CF from SATREP were detected
- 10% of the SATREP CF were only ½ to 2/3 detected
- Slightly better performance in the summer period
- 15% of the SATREP CF are not detected in ASII from IR image (warm cloud tops)
- CF in CA performs better than average (58%)

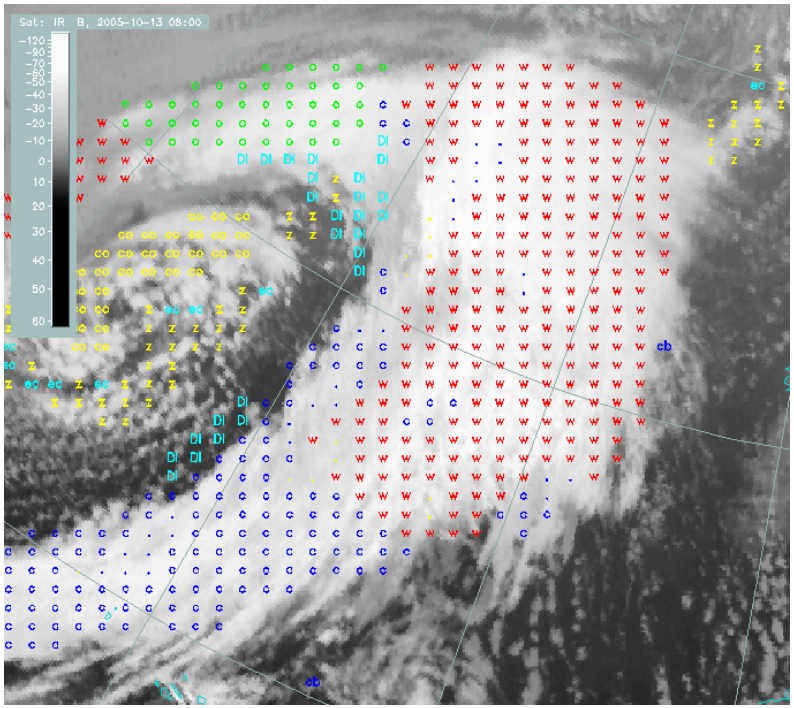


Evaluation of ASII: Frontal Categories

Warm fronts:

- 50% of the SATREP WF are analysed as WF in ASII
- no seasonal or daily trend
- WF shields are better detected than WF bands or detached WF.
- 5.5% of the SATREP WF are not detected in ASII

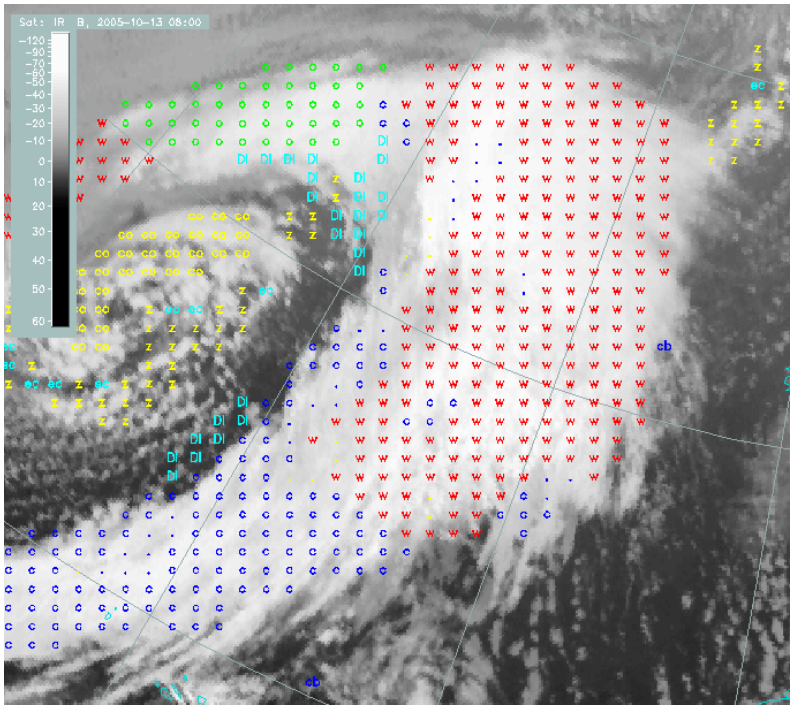
- Misclassified WF are mostly analysed as CF due to their band like structure



Evaluation of ASII: Frontal Categories

Occlusions:

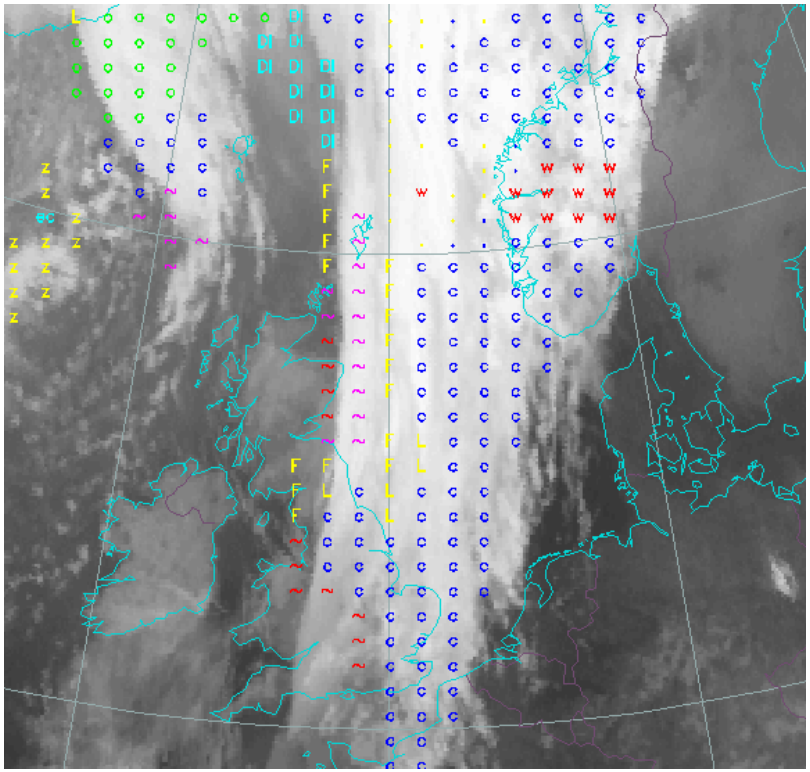
- Detection rate of 40% for all Occlusion types
- Weak seasonal trend: better detection rate in the summer period
- As for the CF, 10% of the SATREP Occl. are at least detected half but not fully
- The most common misclassification is CF with 15% of all cases



Evaluation of ASII: Frontal Waves

Waves:

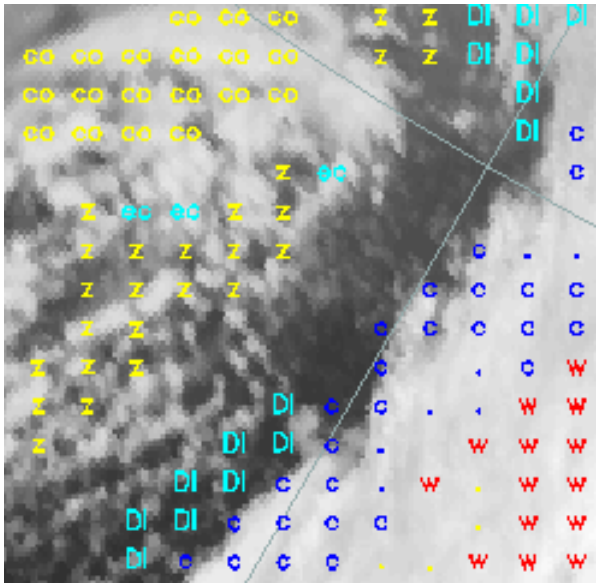
- The overall performance of frontal waves lies at 25%
- Waves are better recognised in the summer period than in winter time (better frontal delineation in the summer)



Evaluation of ASII: Enhanced Cumuli

Enhanced Cumuli (EC):

- ASII detects about 40% of the SATREP EC
- Slightly better performance in the summer period
- Approx. 41% of the SATREP EC are misclassified
    - in 10% Comma is analysed
    - in 3% CB Cluster
    - in 5% cold air cloudiness
    - in 17% the region is considered as frontal
- 14% of the SATREP EC are not detected in ASII



Evaluation of ASIINWP: General Remarks

- **With the inclusion of NWP data (ECMWF), the PGE10 output is slightly modified although the algorithm based on satellite data is very similar.**

- **Some CM cannot be retrieved without NWP data:**
  - **the Upper Level Low**
  - **FI by Jet**
  - **the Upper Wave**

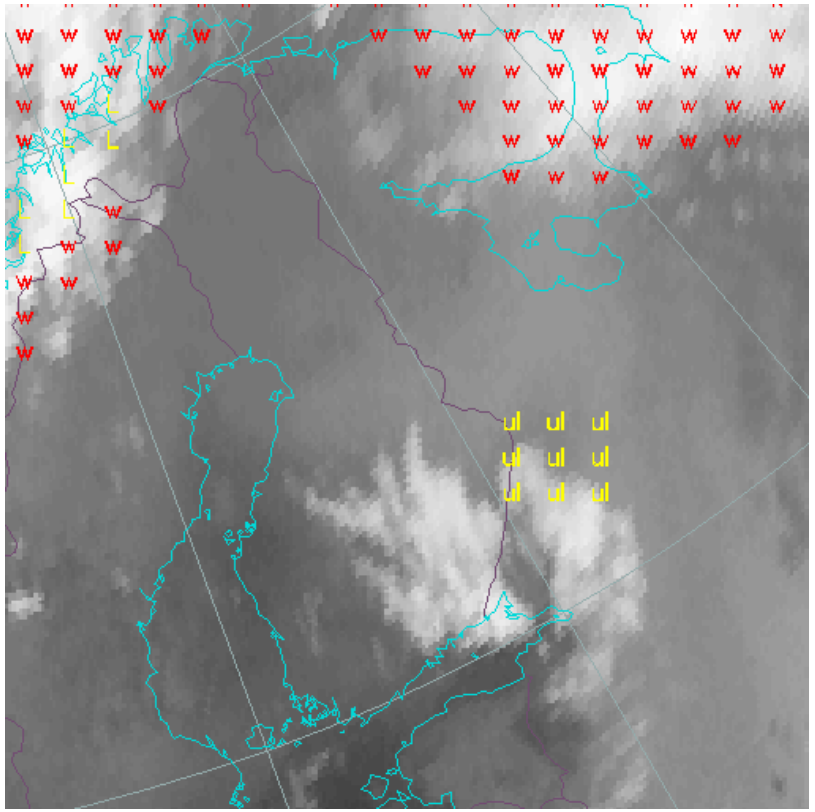
ASIINWP: Overall performance

All CF:	58.5%	Upper Waves:	17.5%
All WF:	47.5%	CAC, CCC:	15.5%
FI by Jet:	47.5%	Frontal Waves:	12%
MCS:	45.5%	Jet Fibre:	8.5%
ULL:	44.5%	OCC:	7%
All Occl.:	40.5%		
ECAC:	38.5%		
CB Cluster:	37%		
EC:	30%		
Comma:	26.5%		
Lee Clouds:	21.5%		

Evaluation of ASIINWP: Upper Level Low

Upper Level Low:

- Detection rate of 44.5%
- Slightly better performance in the winter period
- 10% of the proposed analyses are Occlusions
- In 13.5% of SATREP ULL cases, either comma, EC or cold air cloudiness is analysed



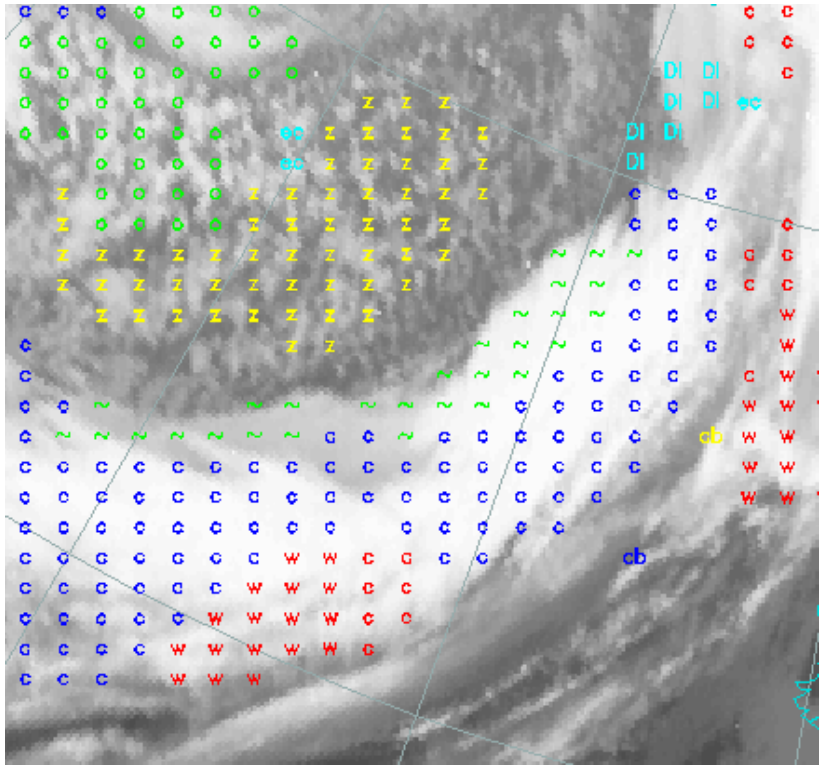
Evaluation of ASIINWP: the Upper Wave

The Upper Wave:

Rare phenomenon in SATREP

- Detection rate of 18%, 8% of the SATREP Upper Waves are at least half but not fully recognised

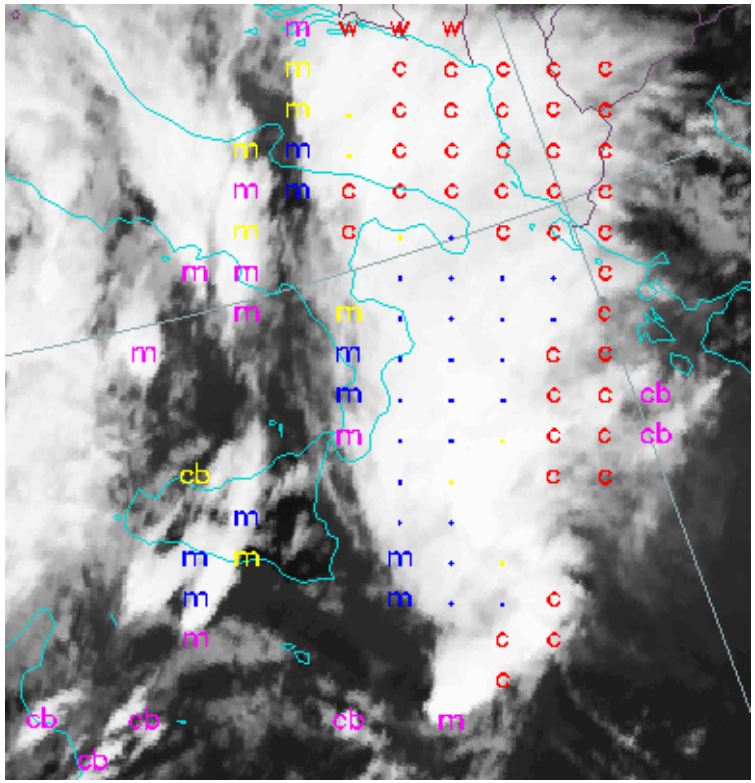
- If ASIINWP does not analyse UW, the frontal tag is displayed (CF, WF or Occl.)



Evaluation of ASIINWP: CB Cluster, MCS

CB Cluster and Mesoscale Convective Systems:

- Detection rate of 45.5% for MCS and 37% for CB Cluster
- Slightly better performance in the summer period for MCS, strong increase in performance for CB
- No daily trend for CB and MCS detection
- Interaction with similar CM (CB, MCS, EC, cold air cloudiness)



Final Remarks

- An evaluation „the other way round“ has not been made. It would have been useful to analyse the synoptic relevance of features detected in PGE10 but not in the manually generated SATREP.
- The Dry Intrusion (DI) has not been validated since there is no corresponding CM in the SATREP.