Extrapolated Imagery (EXIM)
Evaluation of recent developments

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EumeTrain Wind Event Week, 2 March 2022

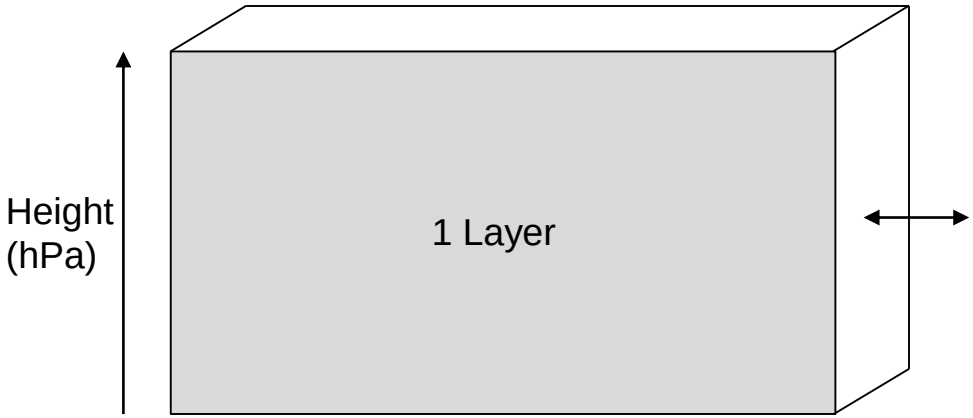
1. Evaluation objectives of EXIM

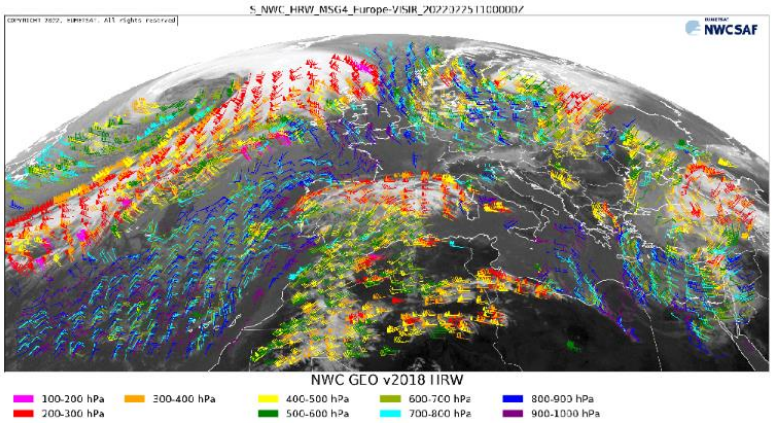
- **“ctth effective”** - new sub-product in the EXIM portfolio
  - NWC/GEO “CTTH”: effective cloudiness
  - user request
  - Evaluation: better than persistence
  - See Validation Report:
    GEO-EXIM-v2.0.1

“ Effective cloudiness (“ctth_effectiv”) is a variable available in the diagnostic product of NWC/GEO “CTTH”, apparently it is not available in EXIM. Since you mentioned it, I’d like to suggest including it in the future as it can be helpful for some post-processing Tasks.”

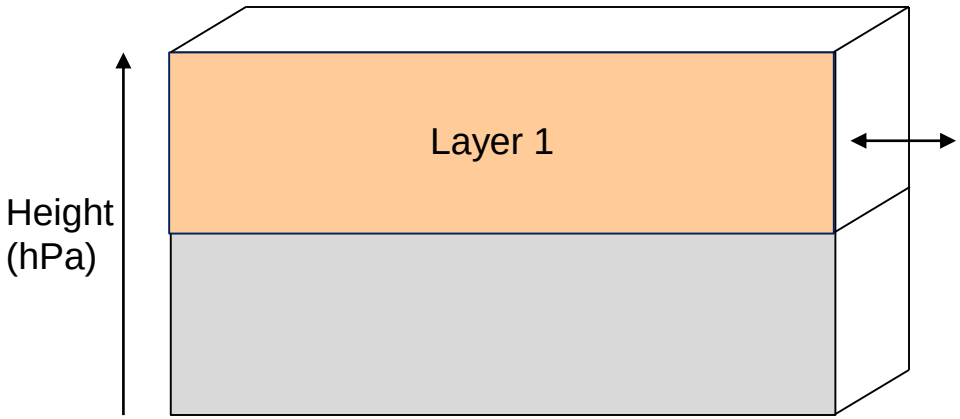
- **ctth filter** - new feature of EXIM
  - Filtering of AMVs and pixels to extrapolate
  - Validation of nowcasts against product/ image at verification time
  - Comparison of setups using filter against control setup
- Validation period: April 2021 – August 2021
- NWC SAF products: CMA, CT, CTTH altitude and effective cloudiness, CMIC phase, PC, PCPh, CRR, CRRPh
- Satellite images: VIS 0.6, VIS 0.8, IR 10.8, IR 3.8

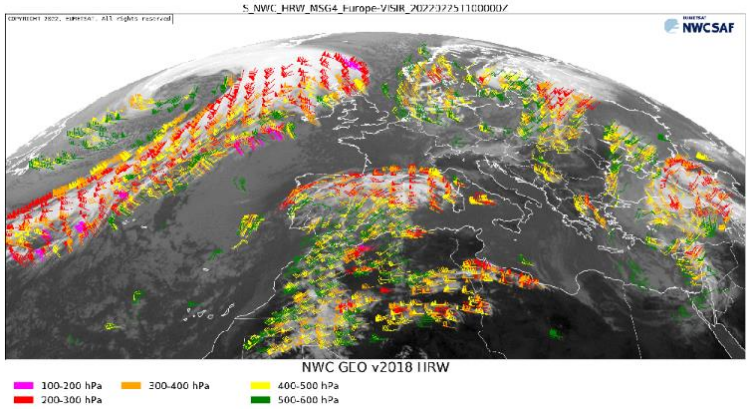
2. Default - the **control** setup



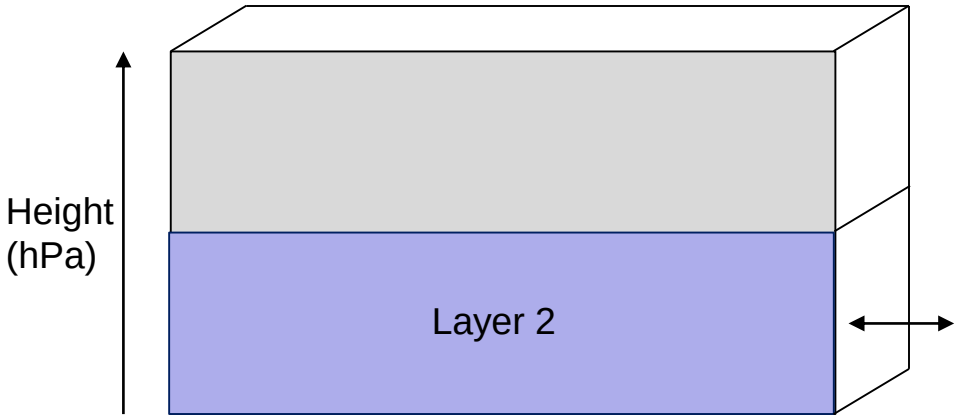


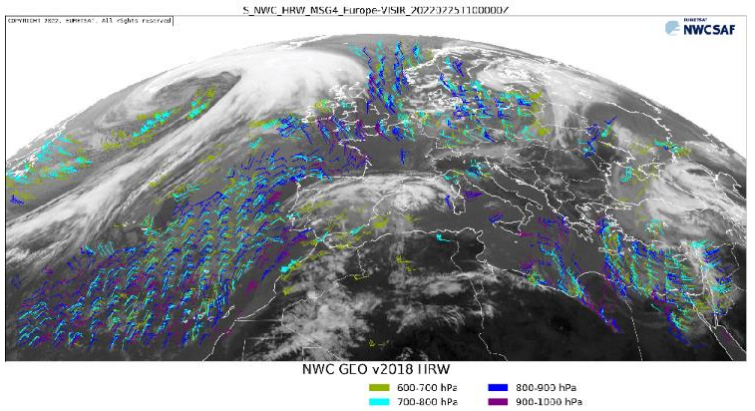
2. Ctth filter – high layer (**High layer**)



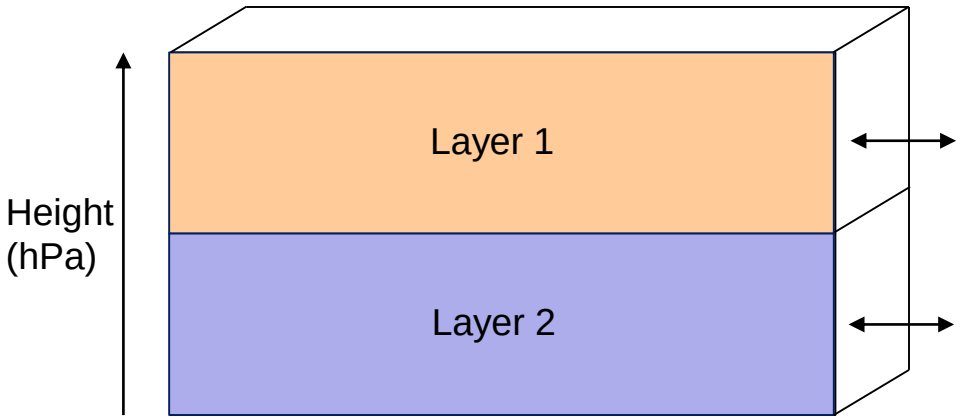


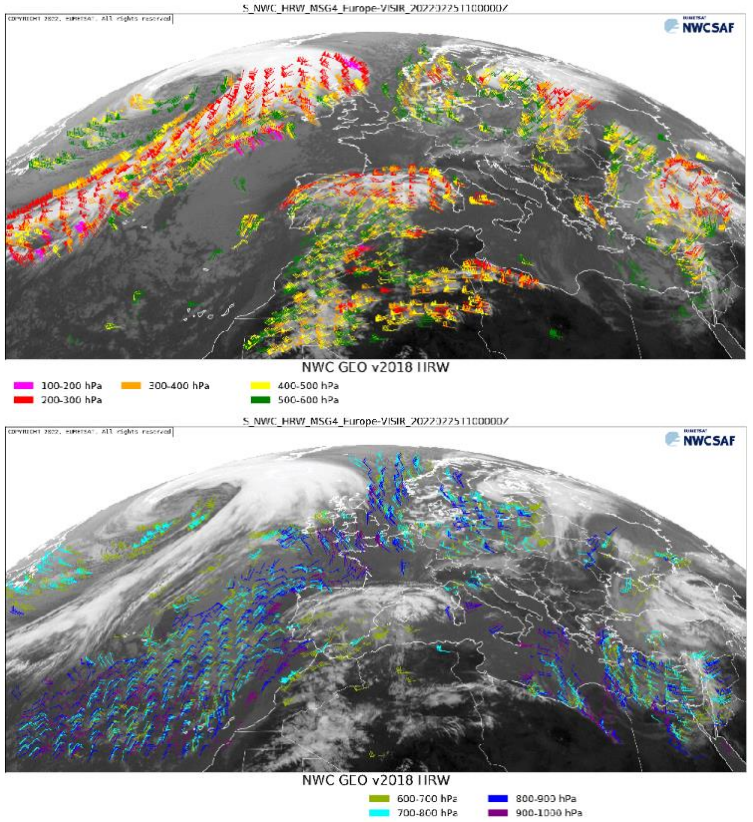
2. Ctth filter – low layer (**Low layer**)





2. Ctth filter – 2-layer scheme(**2 layers**)





2. Dichotomous scores

- Probability of detection (**POD**)

  POD = a / (a + c)

- False Alarm Ratio (**FAR**)

  FAR = b / (a + b)

- Probability of False Detection (**POFD**)

  POFD = b / (b + d)

- Peirce Skill Score (**PSS**)

  PSS = POD – POFD

		observed	
		yes	no
forecast	yes	**a** Hits	**b** False Alarms
	no	**c** Misses	**d** Correct Negatives

Multi-categorical variables

- Peirce Skill Score (PSS_{mc})

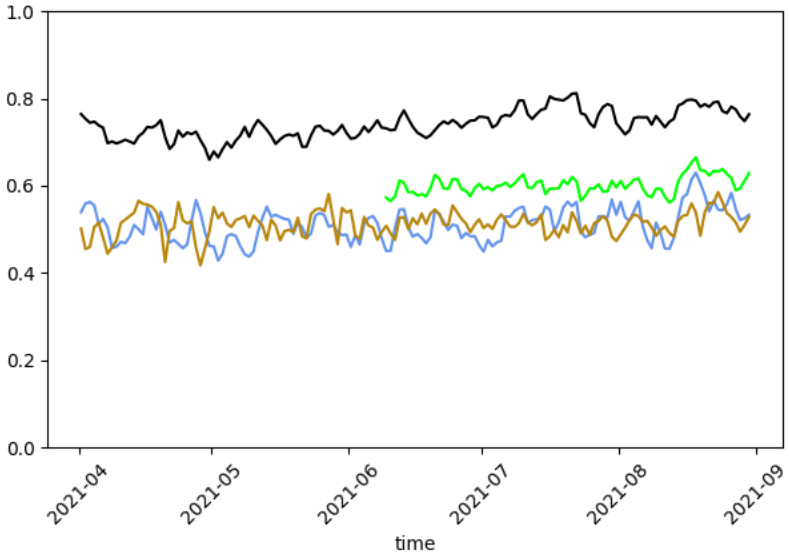
	Observed category					
Forecasted category	i, j	1	2	…	K	Total
	1	$n(F_1,O_1)$	$n(F_1, O_2)$	…	$n(F_1, O_K)$	$N(F_1)$
	2	$n(F_2, O_1)$	$n(F_2, O_2)$	…	$n(F_2, O_K)$	$N(F_2)$
	…	…	…	…	…	…
	K	$n(F_K, O_1)$	$n(F_K, O_2)$	…	$n(F_K, O_K)$	$N(F_K)$
	Total	$N(O_1)$	$N(O_2)$	…	$N(O_K)$	

3. Control continues being the best

- Cloud type (CT), cloud microphysics (CMIC) phase
- Holistic approach including all categories
- Categories without height assignment → get lost
- → PSSmc **worse than control** setup

Control
High layer
Low layer
2 layers

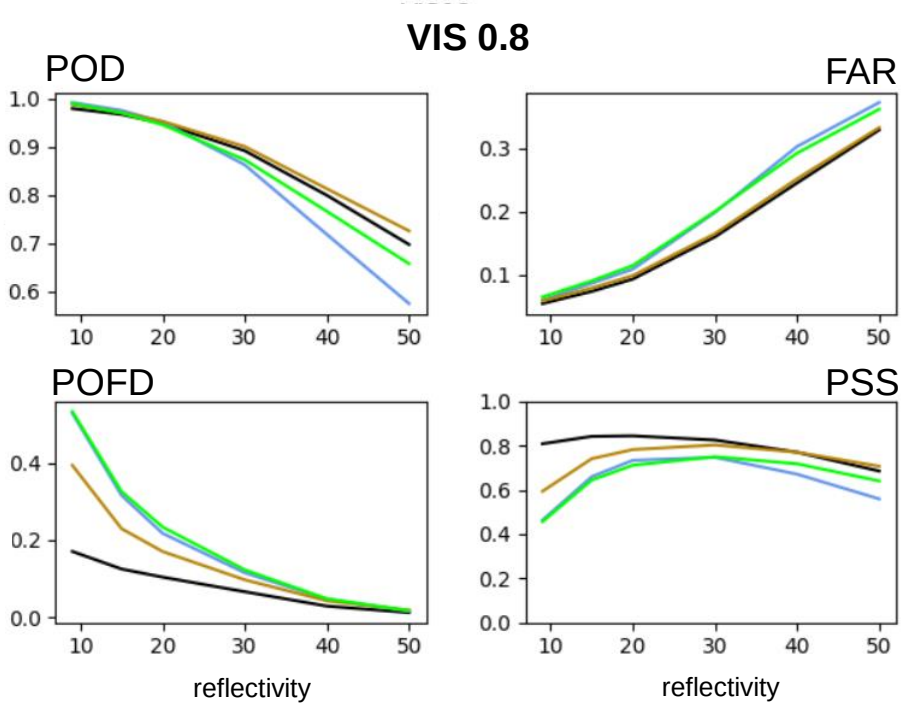
PSSmc **Cloud type**



3. Control continues being the best

- VIS 0.6, VIS 0.8
- Overall no improvement
- High layer for some thresholds as good as control

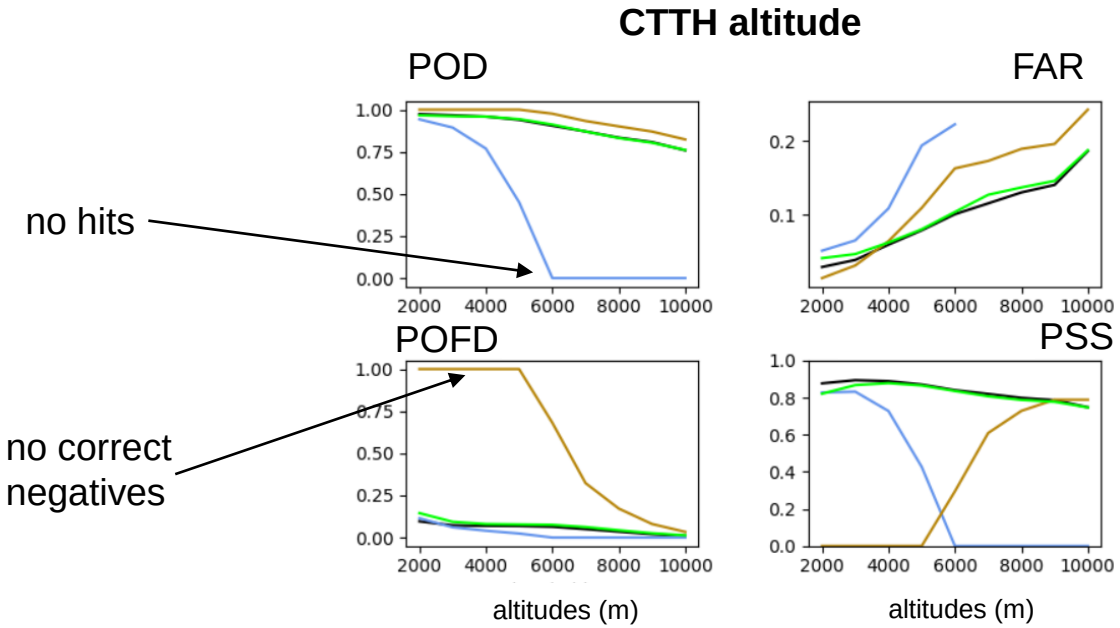
Control
High layer
Low layer
2 layers



3. “2 layers” can compete with control

- IR10.8, IR3.8, CTTH altitude
- Strongly height dependent products/ satellite channels
- High/ Low perform good in their associated height
- 2 layers competitive with control

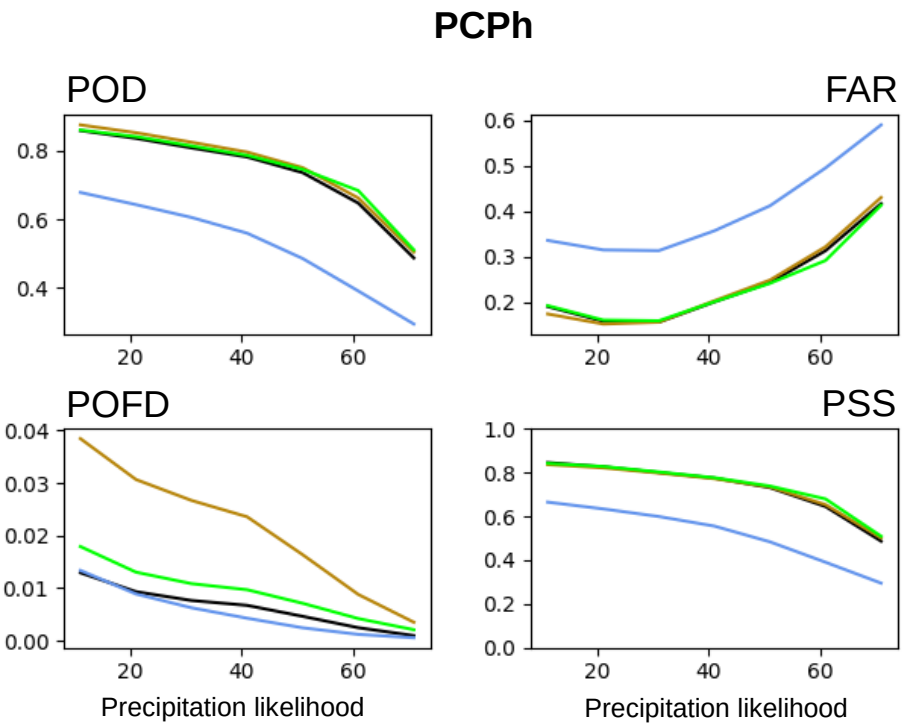
Control
High layer
Low layer
2 layers



3.“High layer” and “2 layers” can compete with control

- Convective Rainfall Rate (CRR), Precipitating Clouds from Physical Properties (PCPh), CTTH effective cloudiness
- Driven by high levels

Control
High layer
Low layer
2 layers



Thank you for your attention!

4. Summary

- Control continues to be the best
  - Multi-categorical approach including all categories difficult to validate with **some categories** getting **lost**.
  - **Visible channels** on average **don't improve** with use of ctth filter.
- 2 layer scheme can compete
  - Precipitation and convective rainfall rates driven by **high levels** – **competitive** with control run in those levels.
  - Strong **height dependency** of some products **reflected** in results.
- Note: A **careful selection of level boundaries according to** user **needs** is essential and can bring advantages not shown due to the holistic approach of this evaluation.
- Results of the evaluation are summarised in a validation report: GEO-EXIM-v2.0.1