Satellite & Nowcasting Workshop 27-28 October 2015

Analysis of the HAIC/HIWC campaigns

Organized by Eric Defer (CNRS) and Julie Haggerty (NCAR)

Hosted by MeteoFrance

Purpose of Workshop

- Review HAIC-HIWC nowcasting and satellite detection approaches developed by each institution
- Review relevant data sets from each flight campaign
- Analyze specified cases from Darwin and Cayenne with each nowcasting system
- Compare results according to specified guidelines
- Develop a plan for consistent verification strategies
- Identify areas for potential collaboration

HAIC/HIWC Satellite & Nowcasting Workshop

List of Attendees

Team	Name
NCAR	J. Haggerty, J. Black
FAA	S. Di Vito
HAIC	J. De Laat (KNMI), E. Defer (LERMA), J. Delanoë (LATMOS), S. Desbios (Météo-France), A. Gounou (Météo-France), A. Grandin (Airbus), J.-M. Moisselin (Météo-France), F. Parol (LOA) SP2 + SP4 representatives (TBC)
Met Office	P. Buchanan, P. Francis

NASA LaRC – remote participation

Products Reviewed
Common Case Studies

- KNMI (HIWC Mask, CPP)
- CNRS (satellite retrievals)
- MeteoFrance (RDT)
- NCAR (ALPHA)
- NASA LaRC (satellite retrievals)

HAIC/HIWC Satellite & Nowcasting Workshop

Cases to Analyze

Campaign	Campaign/ Flight #	Date	Lat range	Lon range	Time range (UTC)
Darwin 2014	1/06	23 Jan 14	16S-12S *20S-10S* (1)	127E-132E *122E-134E* (1)	17:00-24:00
	1/22	17 Feb 14 b	13S-10S	126E-132E	19:00-02:00
Cayenne 2015	2/26	29 May 15	3N-6N	54W-50W	06:00-12:00
	2/22 (a)	23 May 15 b	3N-9N	58W-51W	12:00-21:00
	2/15 (b)	16 May 15 b	2N-7N	55W-51W	13:00-20:00

(a) IKP data not available yet.
(b) IKP data won't be delivered yet.
(1) TRMM overpass.

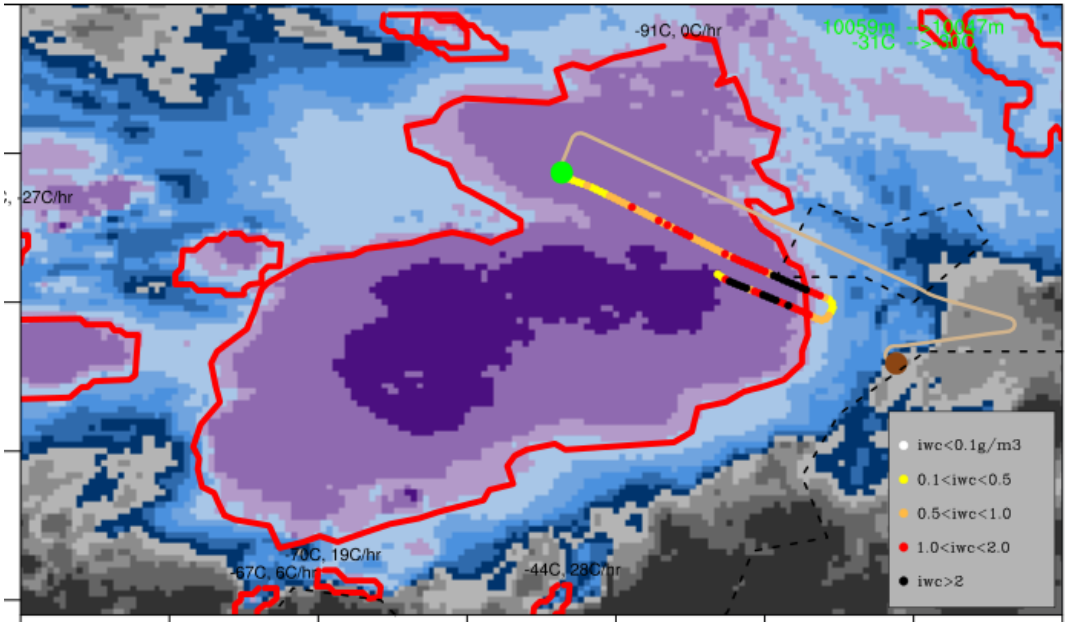
Products to prepare

- For each case
  - Plot satellite products and nowcasting images for the range and time period listed in the previous table
  - Bring the satellite products and nowcasting datasets at the workshop to perform overlays if needed
  - Discuss the case from the satellite products and nowcasting images (consistency, anomalies…)
  - Extract the satellite-based product/nowcasting data along the track of the aircrafts and store the information in an ASCII file
    - Bring the ASCII files during the workshop
  - Extract the satellite-based product/nowcasting data (mean, min, max, standard deviation) in a range of 5, 10, 25 and 50 km range (i.e. circular area with varying radii) along the track of the aircrafts and store the information in ASCII files (to investigate the homogeneity around the A/C measurements)
  - Plot the satellite-based product/nowcasting data retrieved along the A/C tracks as a function of time

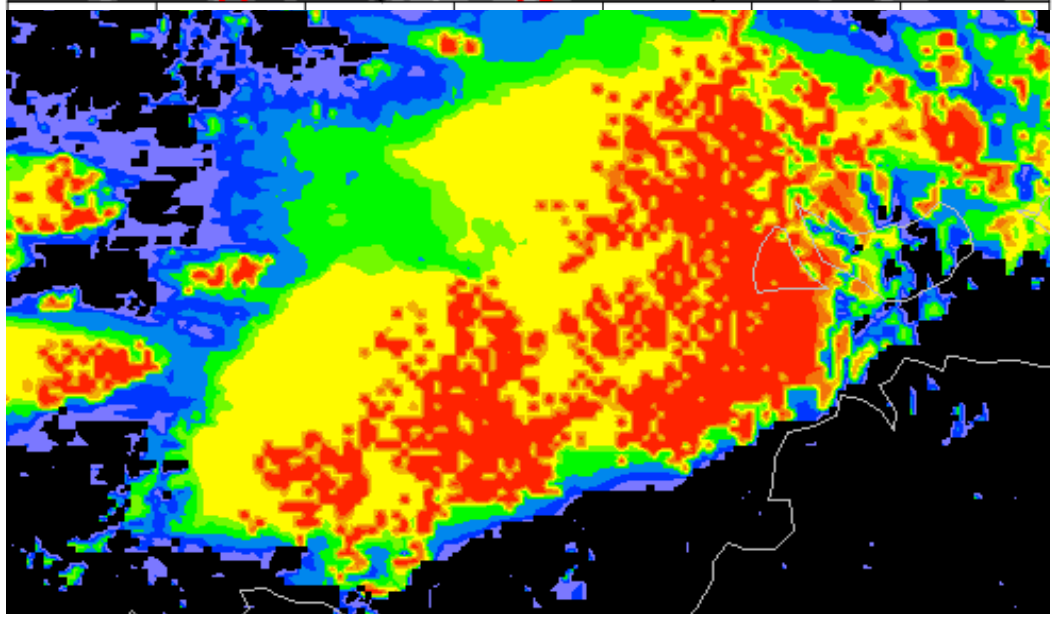
Product Comparison Methodology

- KNMI mask, RDT, satellite products are yes/no and 2-dimensional
- ALPHA HIWC product is scaled from 0-1 and 3-dimensional
- Agree upon yes/no thresholds and apply to all products (IWC ≥ 0.5 gm^{-3} = yes)
- Degrade ALPHA to 2 dimensions (max interest in column)

Darwin F22
17 Feb 2014



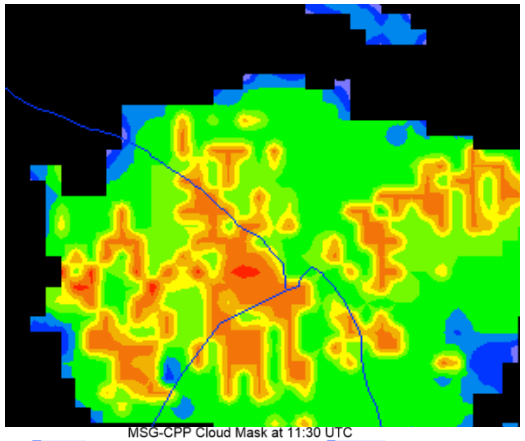
RDT



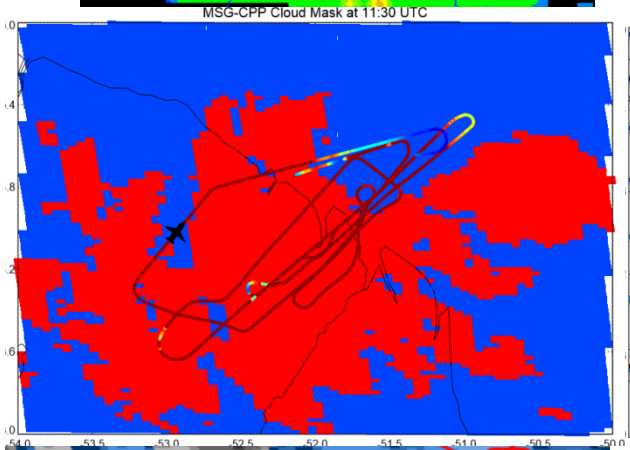
ALPHA (flight level)

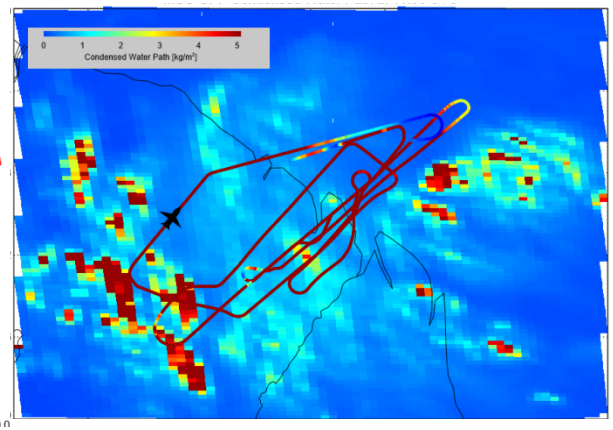
Cayenne F26
29 May 2015

ALPHA
Interest

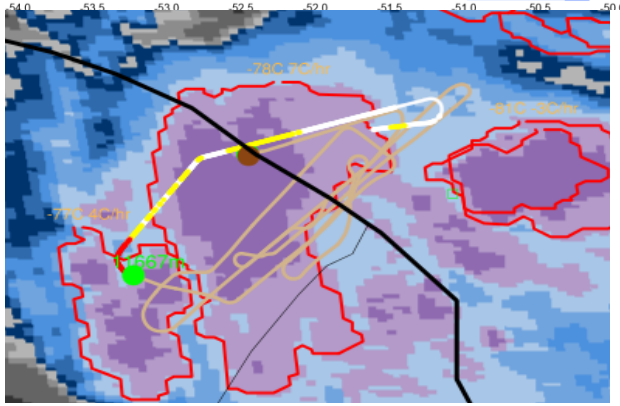


KNMI Mask





RDT



UK MetOffice

Summary of short-term plans

In the initial phase of the work, we plan to develop a nowcast tool focused on the 0-1 hour timescale, with future work to develop longer term forecasts. World Area Forecast Center (WAFC) would be the home for an HIWC nowcast product.

Satellite/nowcast

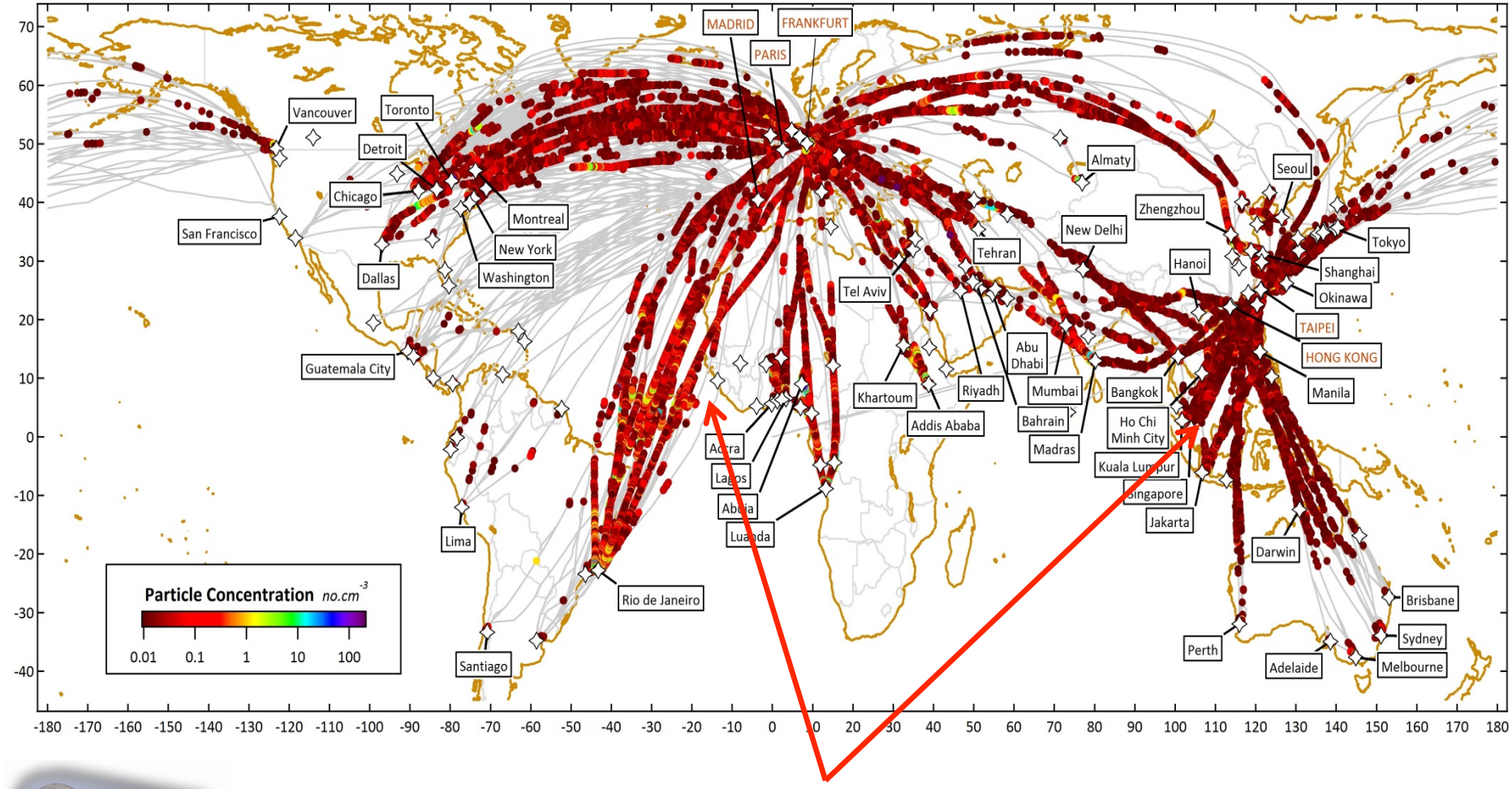
- Development of satellite product to identify hazardous regions of high ice water content (HIWC)
- Assess HIWC satellite product against in-situ observations (from IAGOS and elsewhere) to aid product refinement
- Assess the lifetime of HIWC regions (to inform the nowcast process)
- Development of an object-oriented HIWC nowcast product utilising the satellite product
- Define HIWC objects based on HIWC satellite product and advected using NWP winds
- Assess whether the global NWP model can add any additional useful information to the satellite observations

Modelling

- Improved understanding of physical processes leading to HIWC and improved representation of HIWC in NWP models
- Simulate observed events across a range of resolutions from global (20km) to regional (1km), making use of the existing operational cloud microphysics and a new more advanced microphysics that is being developed for the UM
- Aircraft and satellite data will be used to critically assess the ability of the model to reproduce these events
- Differences between the modelled and observed fields will be used to direct model development to improve the predicted ice water content properties of these clouds

MANCHESTER 1824
The University of Manchester

Coverage over a significant fraction of the world
Significant increase in SE Asia in last year



Many IAGOS routes cross regions of potential high ice water content (IWC)

Post-Workshop Activities (1/2)

1) Comparison study of satellite products from Cayenne 2015 campaign
    1) Inputs : three sets of ice water data IKP (plane level), IWC_RASTA_{MAX}, IWC_RASTA_{MAX}(Z>FL270), values averaged on 20-second type period (satellite pixel) [average first, and find the IWC_{MAX}]
    2) Consider in-cloud and transit legs
    3) Plot time series on the same chart + overlay the products on the same satellite image (for specific legs or times)
        1) Parameters to provide from frames just before and just after in-situ measurements :
            1) ALPHA : parameter interests, in/out
            2) KNMI : in/out, LWP
            3) RDT : in/out
            4) Provide the time delay between the satellite and the in-situ measurements at the pixel scale [action EDe]
        2) Time stamped on the center of the 20-sec time window
    4) Identify the cases (3-4 flights) to study (including the Golden case) through the NCAR catalog for different types of cases (in situ IWC values, in-cloud/ transit legs) [action JHa through discussions with HAIC-HIWC members] (by December 2015)
    5) Target date : March 2016; Monthly teleconferences to organize (1st one in early December)

Activities (2/2)

1) Verification
    1) Teleconference with J. Delanoë and A. Protat on the use of RASTA and DARDAR products as references for the verification
    2) Add special item on verification strategy during each next HAIC-HIWC-Sat teleconference

2) Blind test
    1) ACa to provide a set of locations/dates (<8-10 cases) in the region where ALPHA, CPP & RDT work
    2) MOZAIC/IAGOS cases [EDe]

Outcome of Workshop

- Immediate benefits
  - Standardized verification methods
  - Better understanding of respective approaches to nowcasting HIWC
- Potential longer term benefits
  - Exchange of ideas
  - Collaboration on new developments
  - Avoid duplication of research efforts