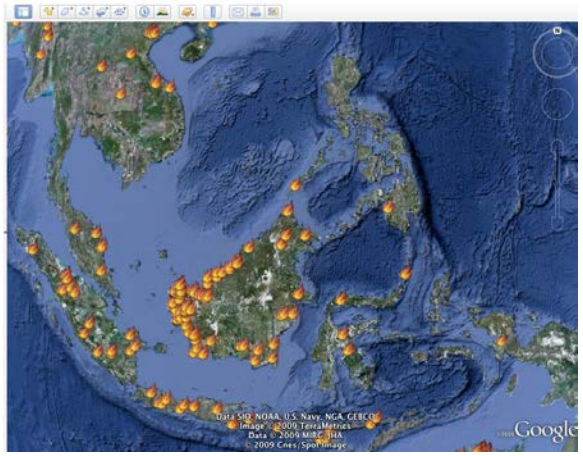
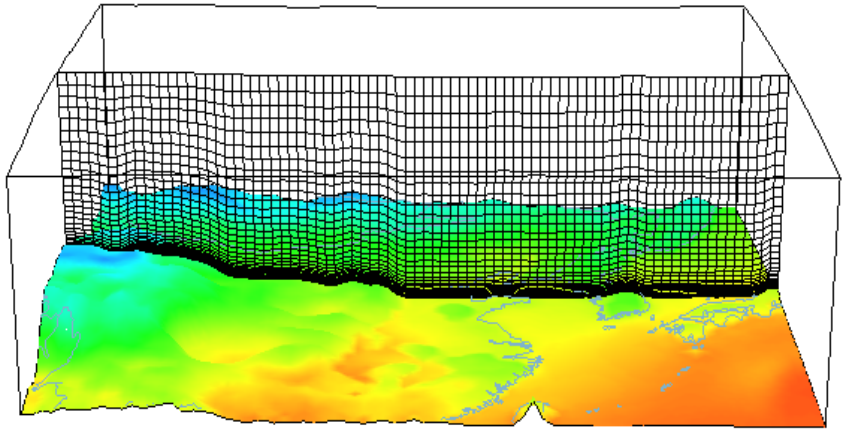
Indonesian Air Quality Model in the MFI SINOP project

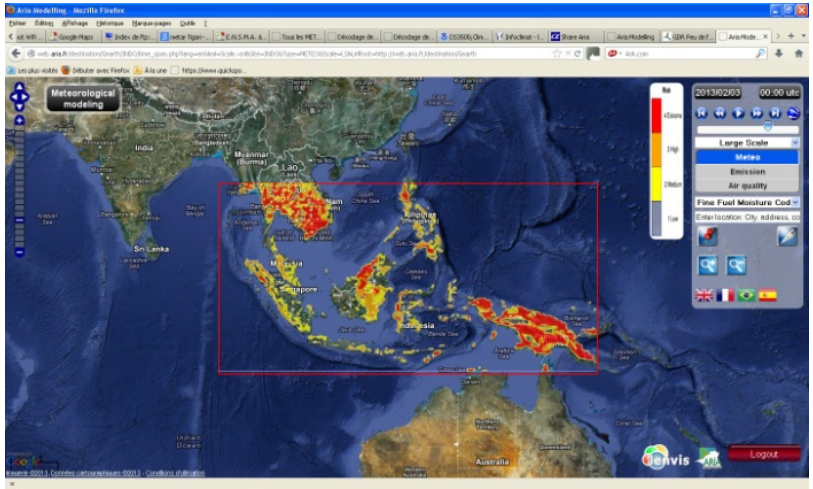


Use quasi real-time fire data



CHIMERE model

Web and tablet capacity



Inside MFI model suite for BMKG

« Strengthening BMKG Climate and Weather Service Capacity »

Session 4: Air Quality & Wave Models

IAQM – Indonesian Air Quality Model

Objectives

Strong BMKG action against haze by daily monitoring / informing / alerting and needs a forecasting IAQM to alert in anticipation

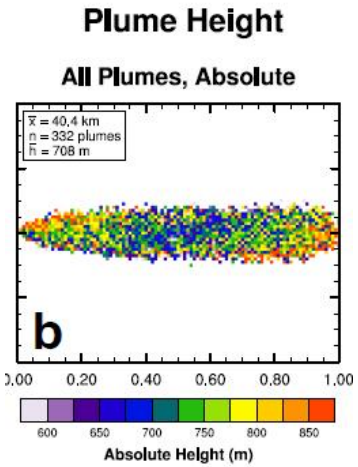
What need the IAQM to reproduce for being a good air quality forecasting system?

- Very thick and persistent haze, especially during dry seasons when El Nino is intense

- Not injected high enough to go outside BL

keep a lot of fire smoke stays in BL => high thickness on ground

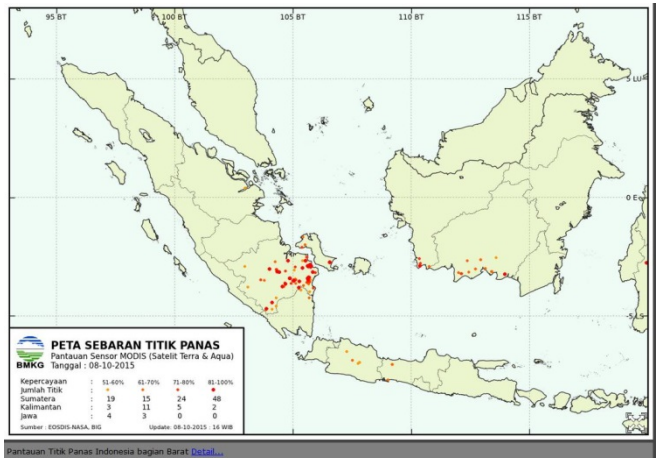
- When no fire haze present, still large urban pollution



Three-wheeled utility taxis like theses burn up to 10 percent oil and contribute to the airborne pollution in Jakarta, Indonesia

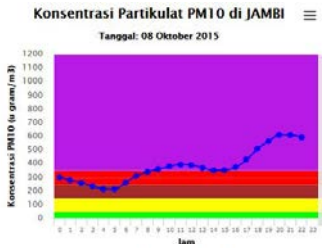
BMKG already informs on haze

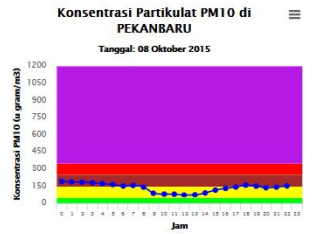
BMKG MODIS-adapted hot spot product with confidence level: helps to locate position of the high impact fires



BMKG FDRS: helps to know current state of vegetation dryness

BMKG daily automatic PM10 stations (8 currently), with analysis and AQI emoticons helps to monitore current air quality conditions in Indonesian cities



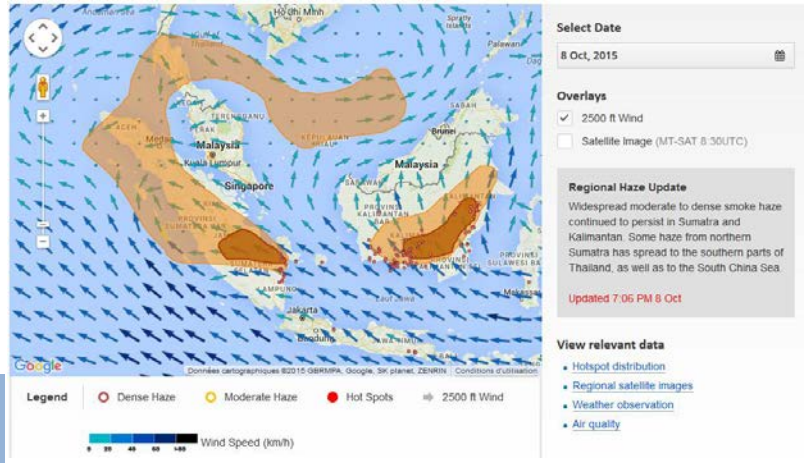


Other existing systems monitoring daily haze in the region?

MACC global forecast system (ECMWF)

But:
No browsable Google-layer
No time series extraction
No downscaling on Indonesia: 1°x1°, 3hrs resolution – no PM10 details for AQ experts
No distinction urban/fire sources, only AOD and ozone maps

Asean ASMC haze composite model/observation



But:
No urban pollution is accounted for

What is the new IAQM product?

A dedicated algorithm on BMKG HPC (CIPS-operated CHIMERE) to produce 73hours forecast : at morning daily, BMKG operators can access to the **AirQuality evolution (fire and urban pollution information) from D-1, D, D+1,** with added value of:
1/ increased space-time resolution (15km, 1hr)
2/ information on urban/fire/vegetation sources of pollution

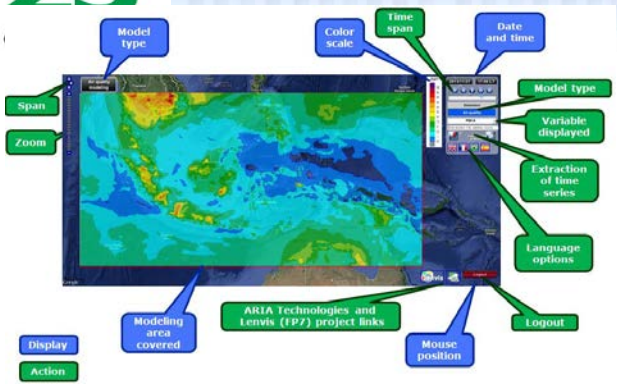
A new dedicated internal BMKG website :
1/ automatic download HPC result to the «IAQM website »
2/ it enables at morning of day D an internal-BMKG expert analysis, by using the website functionalities, of the AQ evolution at D-1, D, D+1

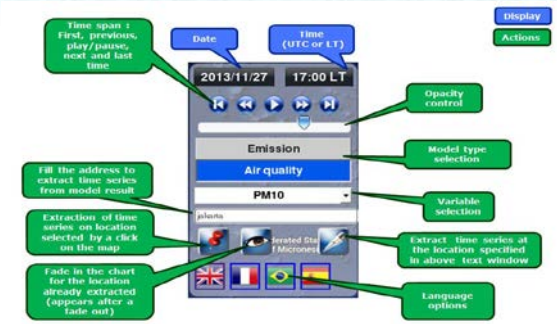
Growing cooperation with BMKG team:
1/ 2-week scientific Training last December in Toulouse
2/ 1-week Operational Training now
3/ 6 trainees from Climate Change & AirQuality BMKG Unit trained to analyze the website output fields and complete a daily report

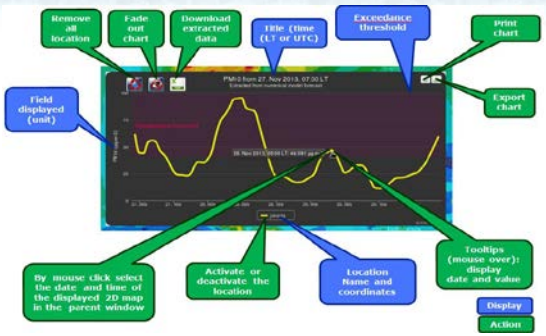
Ready to operate even in very severe conditions…

IAQM website

Dedicated analysis functionalities





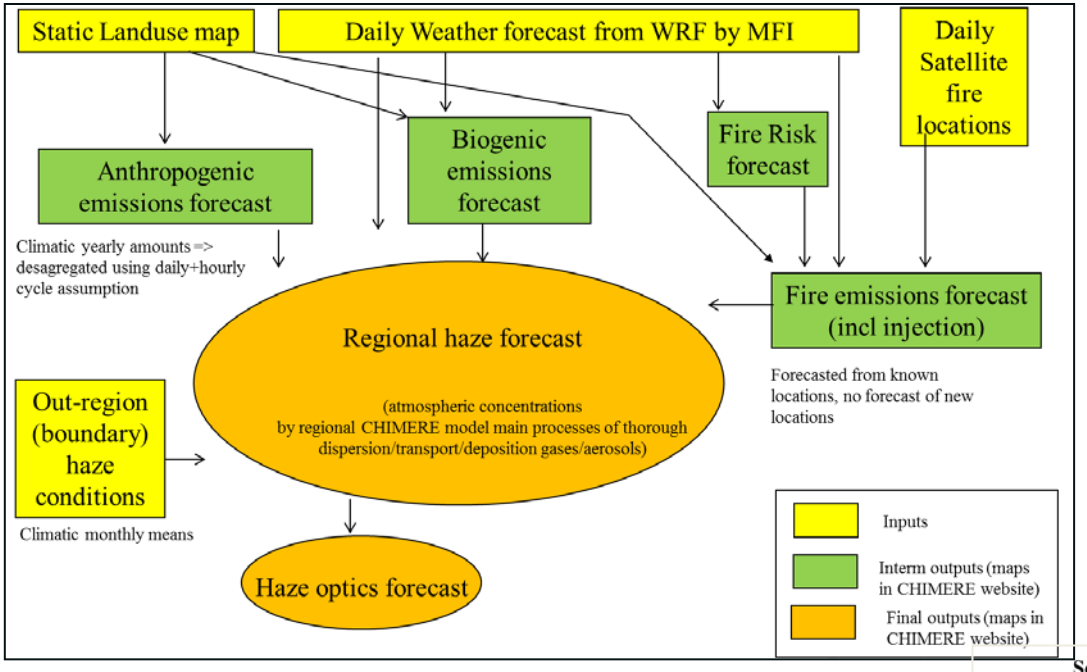


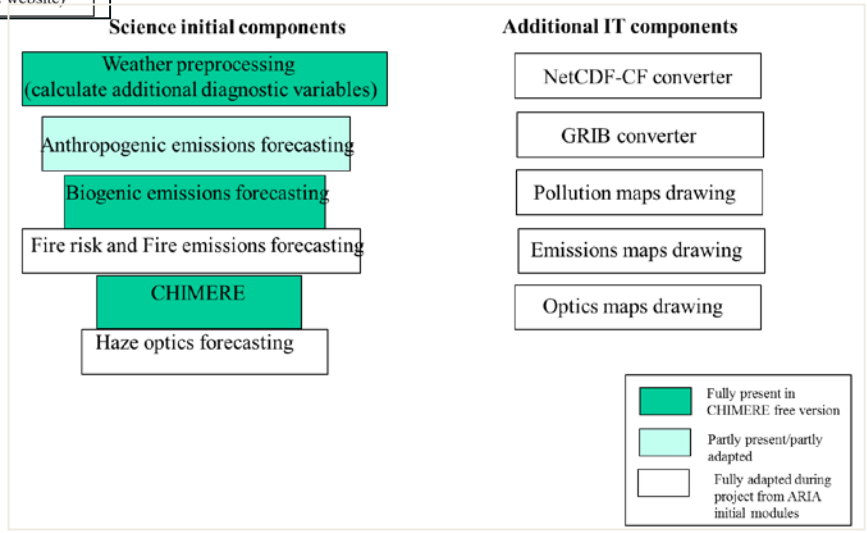
- **Synthetic haze and urban pollution indices:**
  - hourly AOD 550nm forecast (thanks to collaboration with LA, Toulouse):
    - 2D displayed in ARIA web site
  - daily AQI and PSI forecast :
    - Display in ARIA web site
    - Provided as separate 2D GRIB file for Transmet

Outputs

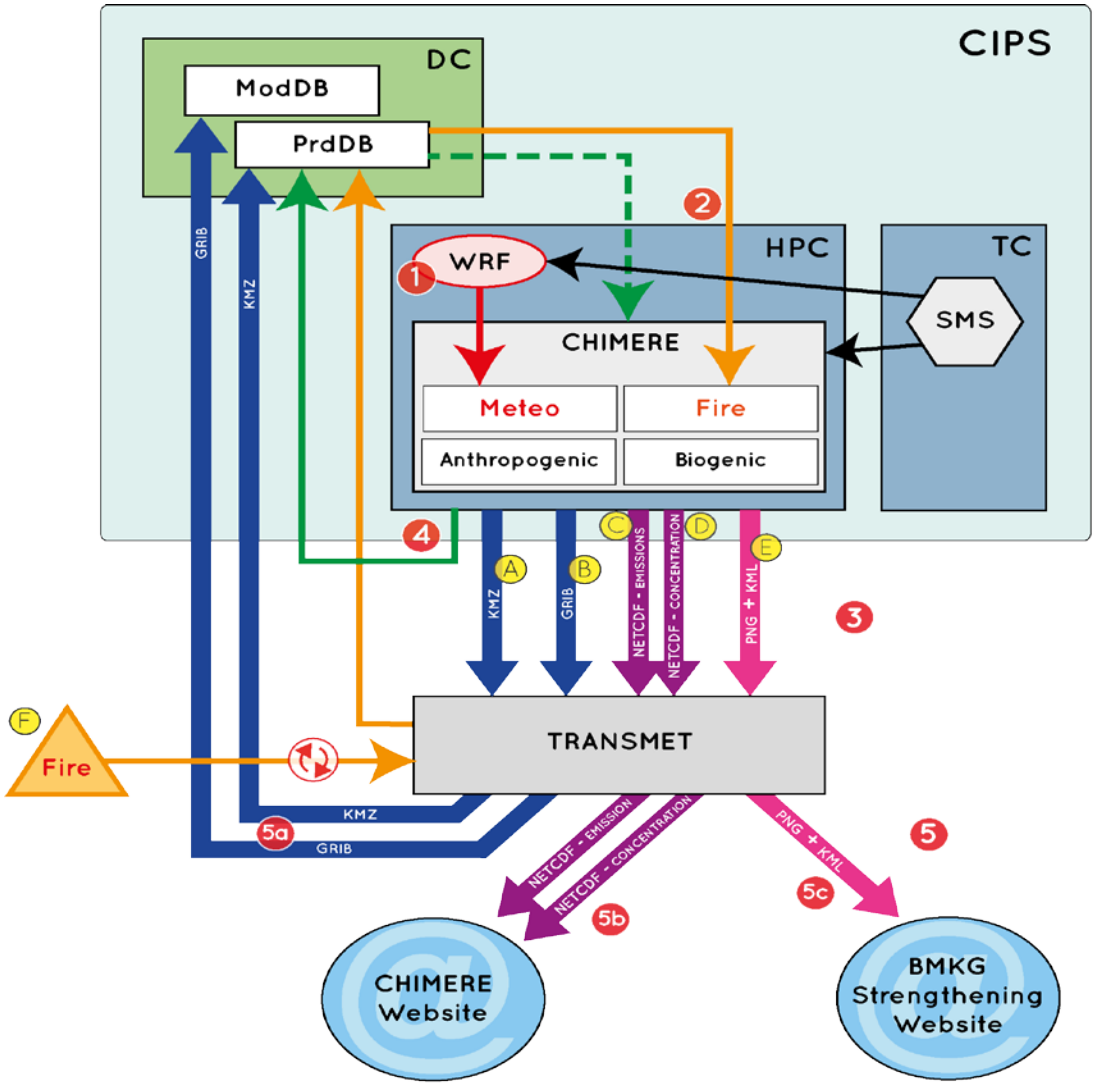
- **More detailed information for in-depth analysis:**
  - hourly detailed concentrations forecast of SO2, PM2.5, PM10, CO, O3, NO2, NOx:
    - 2D display in AQ website
    - 3D GRIB file for Transmet (in finalization)
  - hourly emissions forecast of SO2, PM2.5, PM10, CO, NO2, NOx:
    - 2D display in ARIA web site
    - 2D GRIB file for Transmet (in finalization)
  - hourly « FDRS forecast »:
    - Display in ARIA web site (in finalization)

IAQM Algorithm description





IAQM integration in Data/Task Manager by MFI



1 → 5 Workflow

Current day data

Previous day data (if available)

A KMZ production (for CIPS prodDB)
HEADER : ZXCH00CIPS

B GRIB 2D+3D files of concentrations
3.6 Go in n-files
HEADER : ZGCX00CIPS

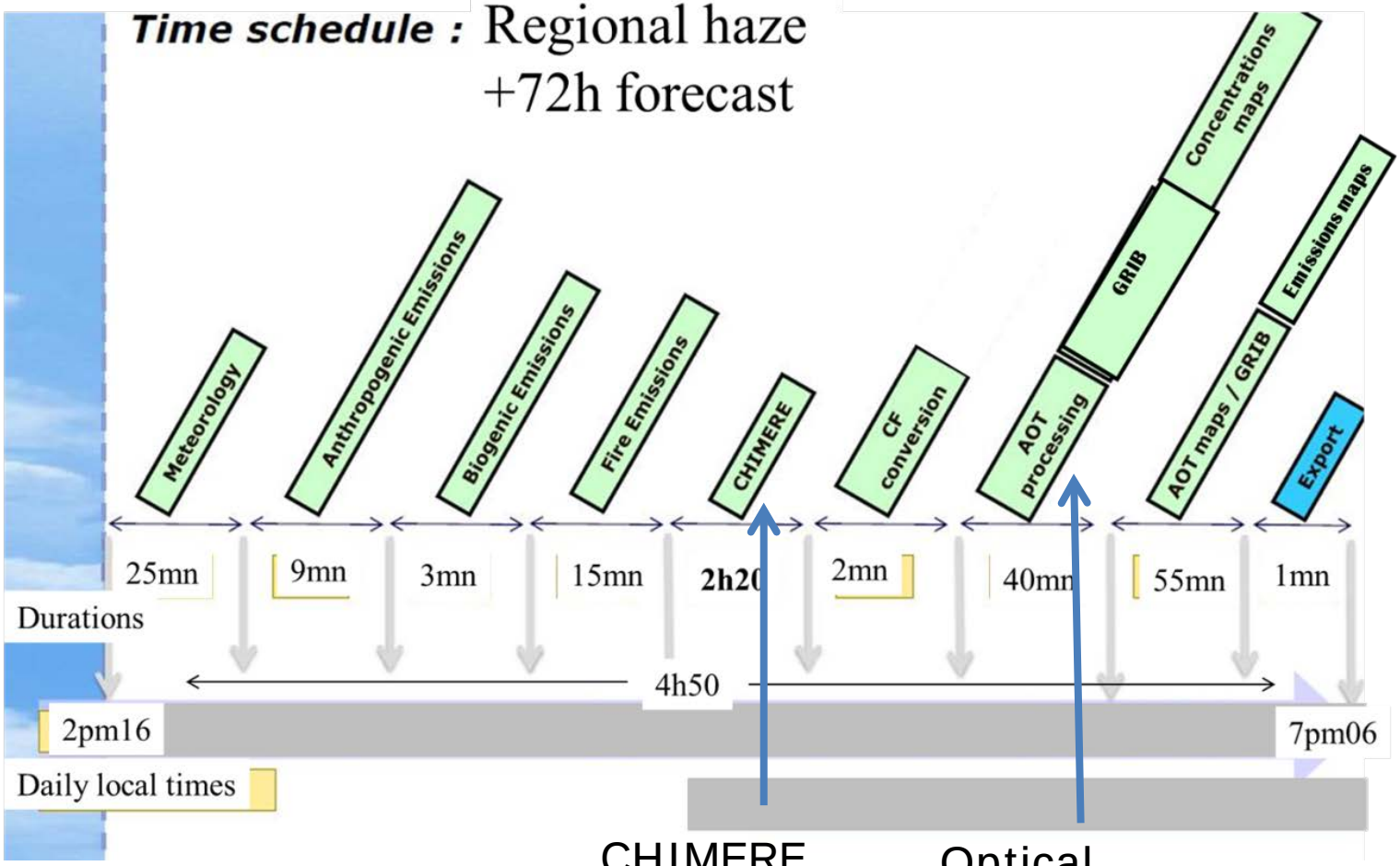
C NetCDF 2D files of emissions
9 Go for almost 20 components
HEADER : ZGCX02CIPS

D NetCDF 2D files of concentration
9 Go for almost 20 components
HEADER : ZGCX01CIPS

E PNG + KML production
a few Mo for a set of 3000 files
HEADER : ZICH00CIPS

F Satellite fire observation file downloaded on FTP and transfered to Chimere
HEADER : ZAFF00CIPS

IAQM CHIMERE optimized use



IAQM Validation

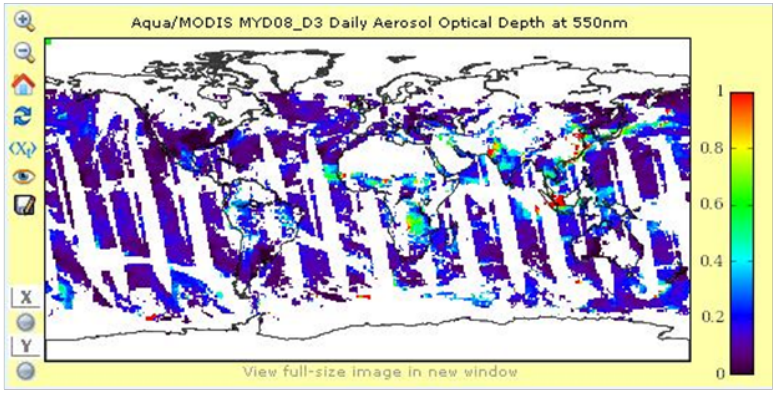
- **Validation could not be performed properly during the setup phase:**

1/ Available in-situ stations at BMKG:

- Manual transmission to BMKG: 6day-average only SPM concentrations – not exploitable – no CHIMERE 6day run possible during setup phase ;
- Recent automatic Thermo 5019i stations : 1day average PM10 (Mr Naibaho, pers comm) – => too many missing data, only june-july 2014 – no CHIMERE historical month run was really possible on cluster in setup phase in 2015

2/ No possible use of satellite data (too many clouds, even in large fire periods):

- No data for recent historical case 21/6/2013
- No satellite data for large recent episodes: 1997 (no usable satellite data), 2006 (MODIS satellite but too coarse data)



Will be done during the exploitation phase, on basis of a day-by-day storage of the IAQM outputs and comparison to BMKG automatic daily stations

IAQM Validation (2)

- **Historical case: 21/6/2013**

PSI= 401 (about PM10=400-500ug/m3) and PSI(IAQM) found in the range 400-500

21 June 2013 Last updated at 19:38 GMT

10K Share

Singapore haze hits record high from Indonesia fires

The BBC's David Shukman explains the impact and cause of the haze

Pollution levels soared for a third day in a row in Singapore, as smoky haze from fires in Indonesia shrouded the city state.

The Pollutant Standards Index (PSI) hit 401 at 12:00 on Friday (04:00 GMT) - the highest in Singapore's history.

The index also reached 400 in one part of Indonesia, which is readying helicopters and cloud-seeding equipment in an effort to tackle the fires.

Indonesia has said it is unfair to blame it solely for the forest fires.

Related Stories

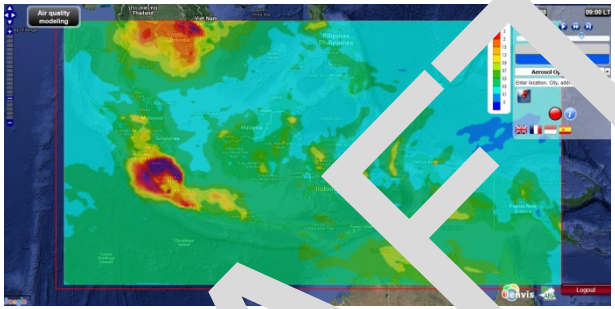
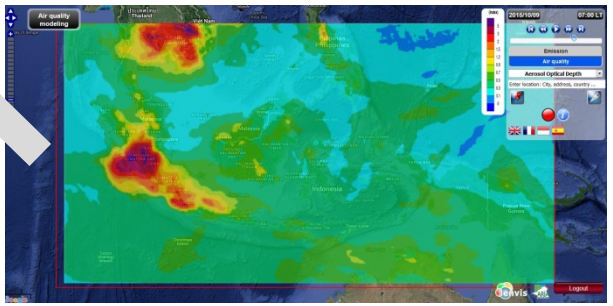
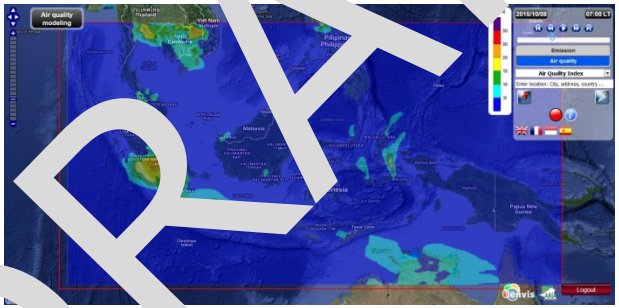
Businesses hit as haze moves in

Singapore haze: 'It's like a bonfire'

Singapore, Malaysia hit by haze

Smoke plume heights in IAQM are found compatible with Zender et al (2012): below 800m (not shown here)

What could be a daily reporting by BMKG operator to public diffusion ?

	Yesterday (07/10 9LT)	Today (08/10 9LT)	Tomorrow (09/10 9LT)
AOD	NO DATA		
AQI	NO DATA		

Current date
08/10/2015

Update report on regional Haze and Pollution type and origin

Persistent fires in Sumatra, tending to evacuate tomorrow.
Urban pollution (see AQI map) is also expected in Surabaya for tomorrow (principally from ozone).

TERIMA KASIH !!!