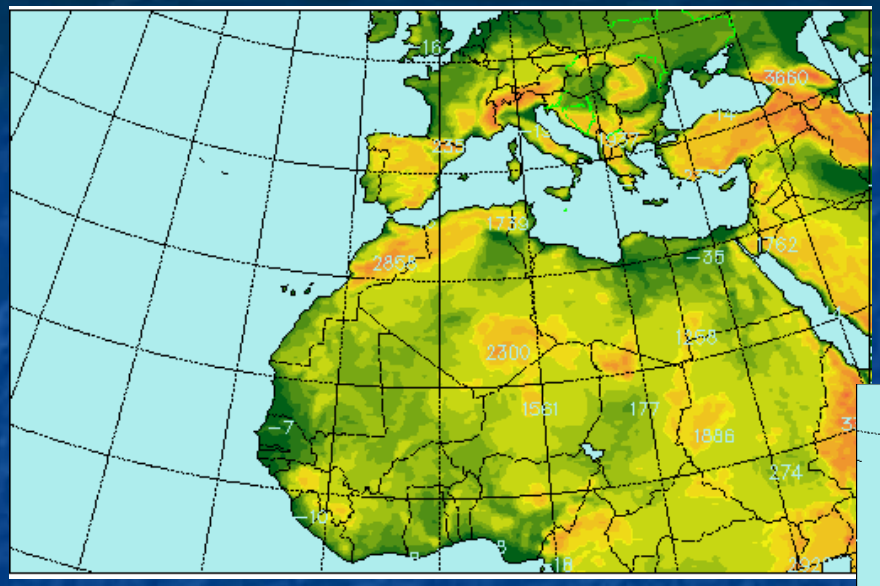
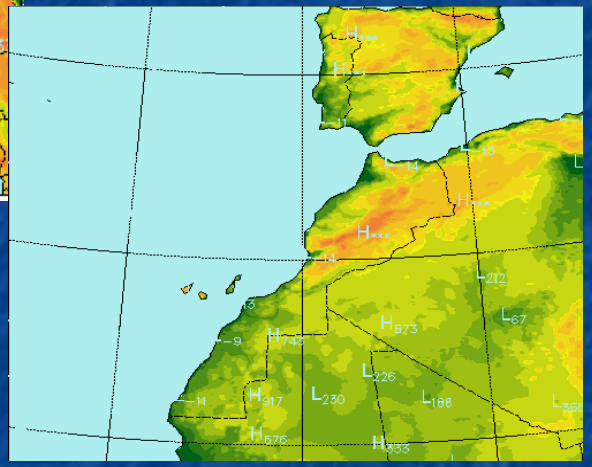
ALADIN SUITES IN MOROCCO
Control of the operational and 3DVAR double suites

Siham SBII & Zahra SAHLAOUI



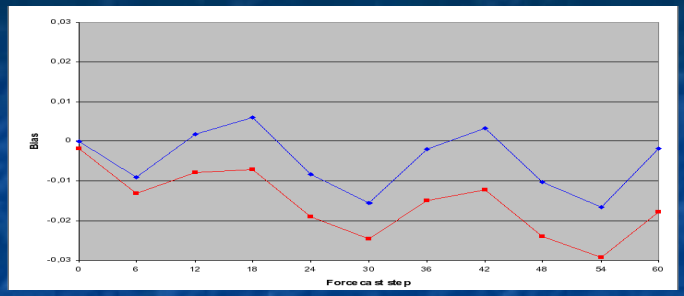
ALADIN/NORAF



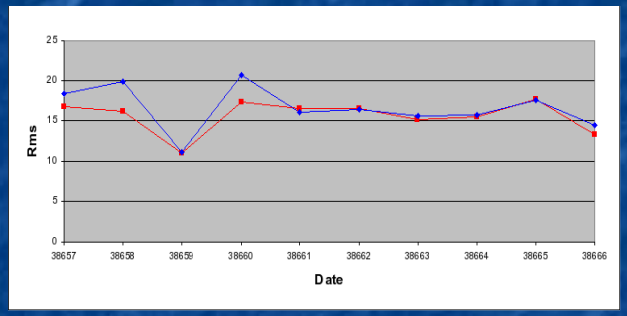
ALADIN/MOROCCO

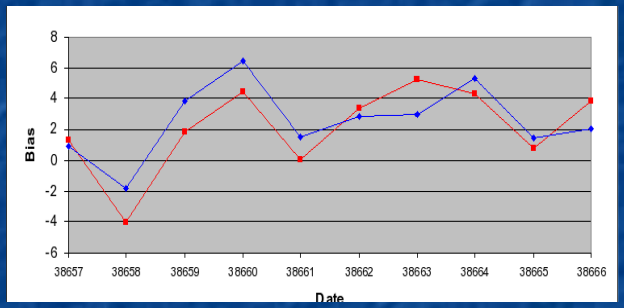
	Horizontal Resolution	Vertical levels	Data assimilation	Range of forecast	Operation cycle	boundary conditions
ALADIN/NORAF	31km	37	Dynamical adaptation	72	CY25t1	ARPEGE Asynchronous
ALADIN/MAROC	16.7	37	Dynamical adaptation	72	CY25t1	NORAF Synchronous

3D-VAR and Operational suites Versus observations



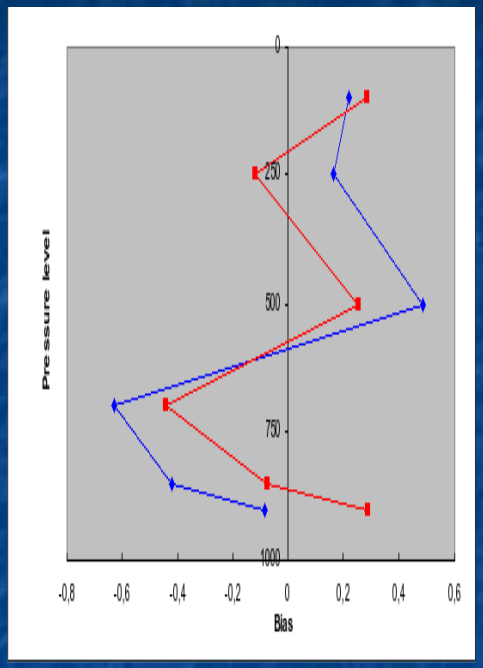
Humidity at 900hPa versus forecast range
(in Red: Dynamical adaptation & in blue: 3DVAR)



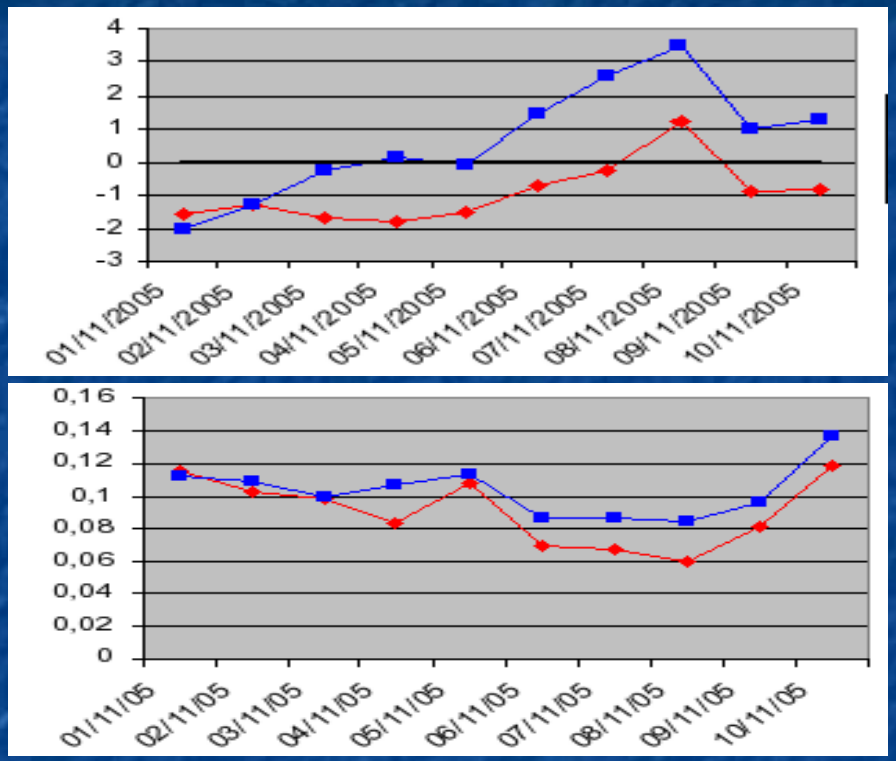


Mean Sea level pressure scores versus synoptic observations
RMS (left) *Bias (right)*
(in Red: Dynamical adaptation & in blue: 3DVAR)

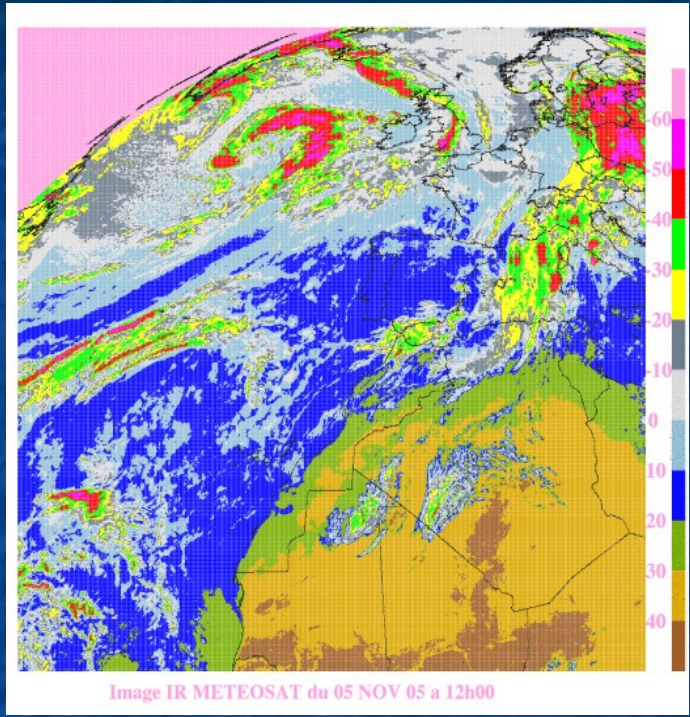
Vertical Profile of temperature bias versus ARPEGE/ ANALYSIS

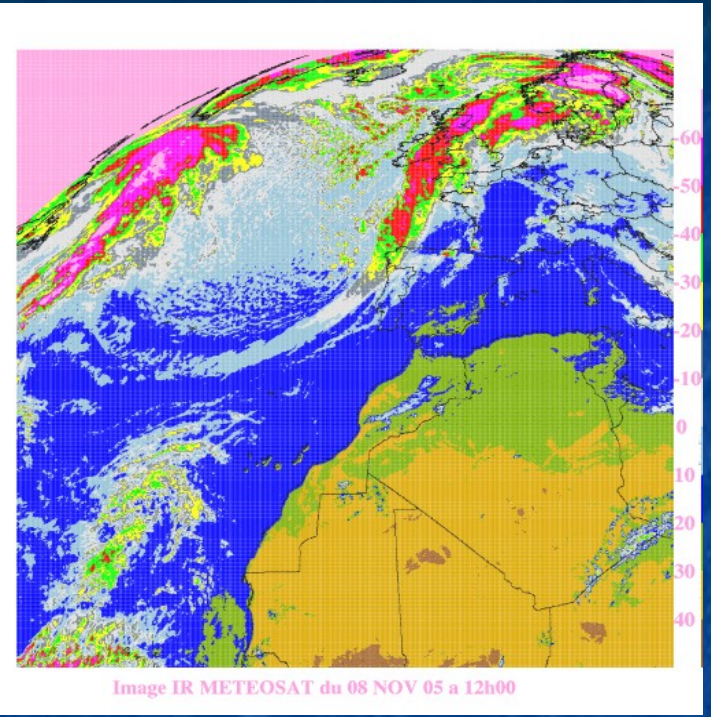


3D-VAR and Operational suites Versus satellite observations

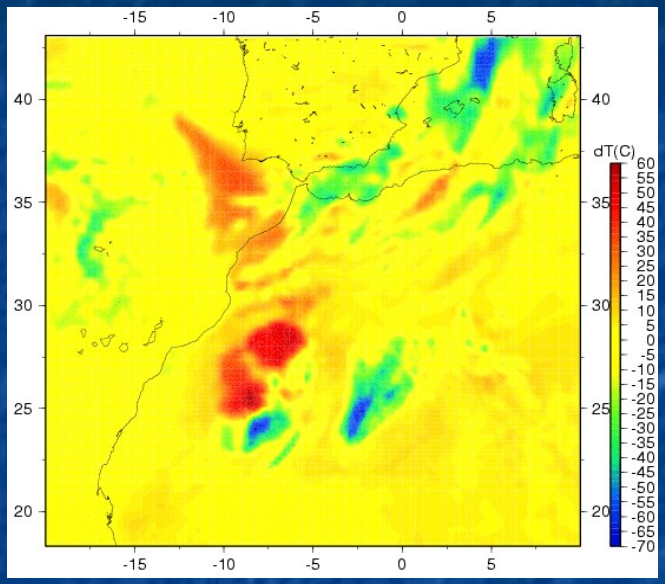


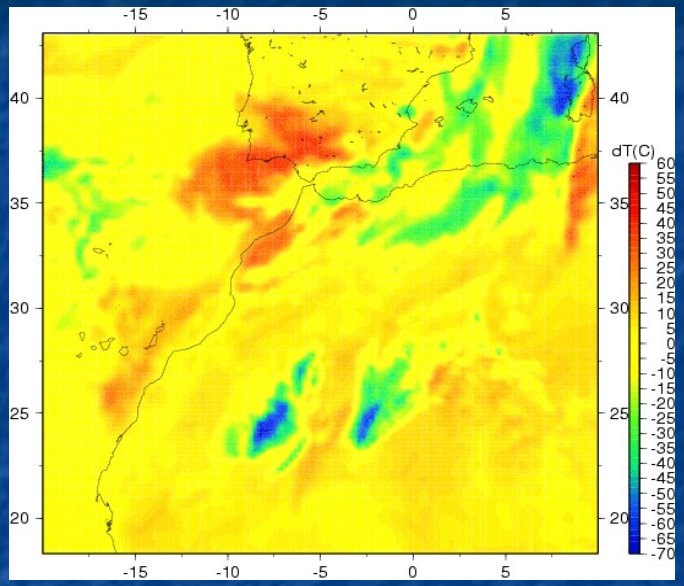
Bias (op) & RMS (bottom) of Brightness temperatures predicted by two suites versus brightness temperatures observed by METEOSAT7. the range of forecast is 12h.
(in Red: Dynamical adaptation & in blue: 3DVAR)



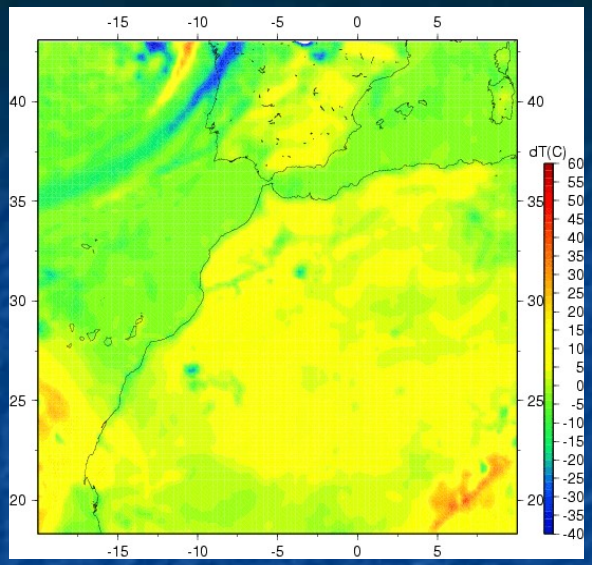


observed satellite images
on the left : 05/11/2005 *on the right* : 08/11/2005





Bias (FORECAST vs OBSERVATION) : 05/11/2005 (12h)
on the left : Dynamical Adaptation, *on the right :* 3D-VAR



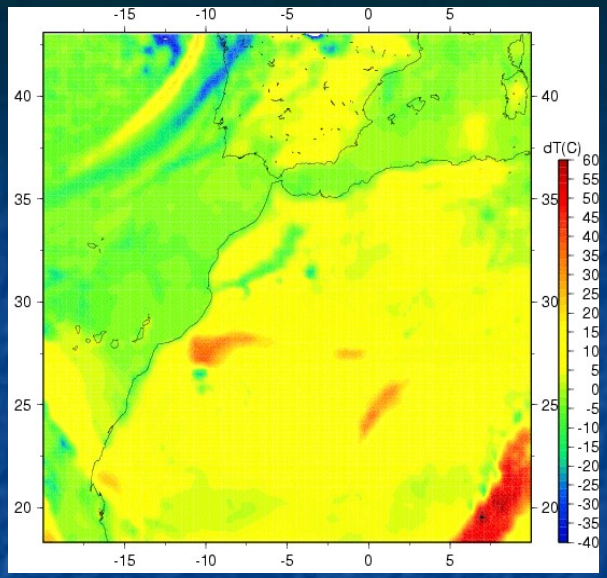


Fig 8: Bias (FORECAST vs OBSERVATION) :
08/11/2005 (12h) *on the left :* Dynamical Adaptation,
on the right : 3DVAR

Conclusion and perspectives:

- No exact conclusion can be done on scores on Tbs, the verification tool using satellite data is not validated yet, more spatial and temporal calibrations are needed.
- The observation used in 3D-Var assimilation technique should be completed by non conventional observations (radiances ATOVS, Radar data …).
- In the surface analysis, it's suggested to use blending instead of CANARI.

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Control of the operational and 3DVAR double suites

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1. Operational NWP Moroccan suites:

Two suites based on ALADIN are run twice a day: ALADIN/NORAF and ALADIN/MAROC.

Their domains are respectively showed in figure1. They are run on an IBM parallel Machine, and u

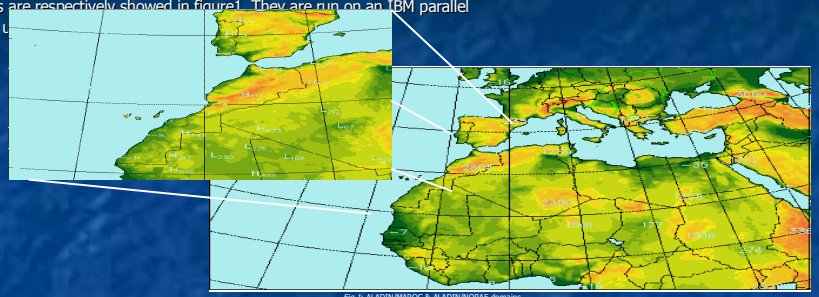

Fig 1: ALADIN/MAROC & ALADIN/NORAF domains

Technical characteristics:

	Horizontal Resolution	Vertical levels	Data assimilation	Range of forecast	Operation cycle	boundary conditions
ALADIN/NORAF	31km	37	Dynamical adaptation	72	CY25t1	ARPEGE Asynchronous
ALADIN/MAROC	16.7	37	Dynamical adaptation	72	CY25t1	NORAF Synchronous

2. Validation of the double suite:

The difference between the operational and double suite is in the initial state: their characteristics are the following:

- Upper air analysis based on 3D-VAR assimilation technique. The fields at the surface are analyzed using CANARI.
- The first guess variance/covariance errors Matrix (Jb) is computed with NMC standard method.
- The only observations used are conventional ones witch are : SYNOP, AIREP, SATOB, DRIBU, TEMP.
- Every 6 hours, an assimilation cycle is launched with 6 hours temporal window for observation (long cut-off) .
- The production cycle is launched once a day at 00h UTC using temporal window about 4h30 in assimilation part (3h before, 1h30 after).

The validation of the 3D-VAR suite is performed over a ten day period on November 2005.

Fig 2: Mean Sea level pressure scores versus synoptic observations RMS (top) Bias (bottom) *(in Red: Dynamical adaptation & in blue: 3DVAR)*

The comparison between 3D-VAR suite and the operational suite based on dynamical adaptation shows a deterioration of scores versus synoptic observation for mean sea level pressure for both bias and rms (random mean square). *(cf figure 2)*

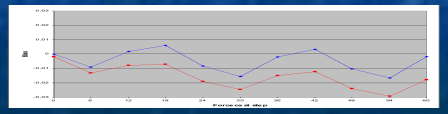

Fig 3: Humidity at 900hPa versus forecast range *(in Red: Dynamical a*

- The bias of humidity is reduced in low atmospheric levels (900 hPa) for all forecast ranges *(cf figure 3)*
- The vertical profile of temperature bias versus ARPEGE analysis shows an improvement in the top and the bottom of the atmosphere, whereas there is an increase of the bias in the middle atmosphere *(cf figure 4)*

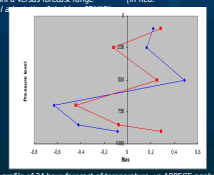

Fig 4: Vertical profile of 24 hour forecast of temperature vs ARPEGE analysis *(in Red: Dynamical adaptation & in blue: 3DVAR)*

3. Control of operational and double suite using satellite images.

This is done due to the model-to-satellite approach, using RTTOV for radiative transfer calculations.

In Moroccan NWP center, some tools have just been developped in order to use this technique for long time series, and to compute the bias and the RMS.

Those scores are evaluated taking into account METEOSAT observation in pixels situated in a fixed circle surrounding every grid point and observed at the corresponded time range.

The comparison between 3DVAR and dynamical adaptation suites based on IR temperatures is done over the same 10 days chosen in the first validation.

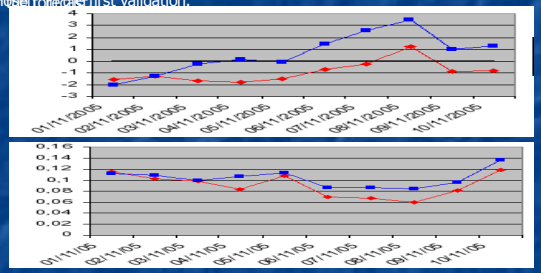

Fig 5: Bias (up) & RMS (bottom) of Brightness temperatures predicted by two suites versus brightness temperatures observed by METEOSAT7. the range of forecast is 12h. *(in Red: Dynamical adaptation & in blue: 3DVAR)*

* In the chosen range of forecast (12h) , there is temporal variation of bias and RMS for both suites.

Generally, the operational suite is nearest from satellite observation than 3D-VAR one *(cf :figure 5)*.

* The spatial variation of the bias is studied over two situations of this period: the 05/11/2005 and the 8/11/2005. The model comportment is totally different in this two situations.

It can be seen on the satellite observation in IR channel *(figure 6)* that Morocco was more covered by clouds in the first situation than in the second.

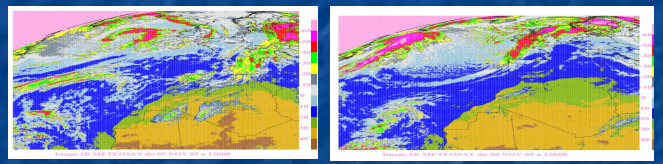

Fig 6: observed satellite images *on the left :* *the ri*

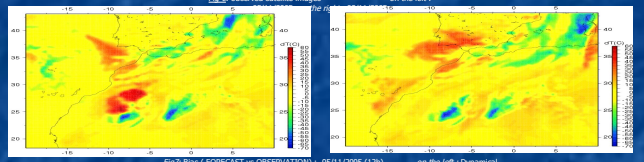

Fig 7: Bias (FORECAST vs OBSERVATION) : 05/11/2005 (12h) *on the left :* Dynamical Adaptation, *on the right :* 3D-VAR

It's confirmed on the spatial variation of the bias over Morocco that 3D-VAR suite is better than the operational suite on the first situation (cf: figure 7) and worse on the second (cf: figure 8) .

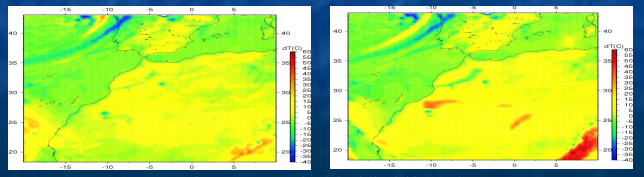

Fig 8: Bias (FORECAST vs OBSERVATION) : 08/11/2005 (12h) *on the left :* Dynamical Adaptation, *on the right :* 3DVAR

4. Conclusion and perspectives:

- The observation used in 3D-Var assimilation technique should be completed by non conventional observations (radiances ATOVS, Radar data …).
- In the surface analysis, it's suggested to use blending instead of CANARI.
- The verification tool using satellite data is not validated yet, more spatial and temporal calibrations are needed.