l ntroduction 0 00	Simulation of IASI and IASI-NG o occoo	Impact of Number of Channel Asimilated 0 00 000	Conclusion 000000

Evaluation of the benefits of assimilating IASI-NG radiances for ozone in a Chemistry-Transport Model

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CNRM - Méteo-France

23 Sept. 2022

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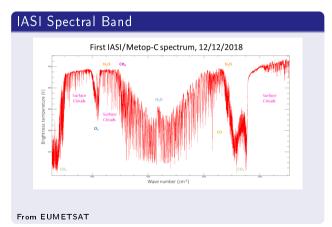
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IASI measures radiation at the top of the atmosphere, with 8461 wavelengths.



This wavelengths are sensitive to :

- Chemical Species (*O*₃; *CO*₂, *CO*)
- Aerosol
- Climatic Variables (Surface Temperature ; Humidity)

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IASI's mission is about to end.

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IASI-NG			

IASI-NG will be launched in 2024 on Metop-SG satellites.

Characteristics

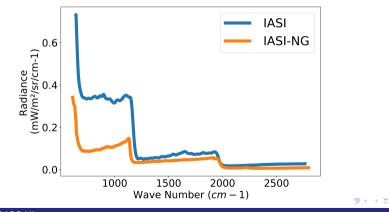
	IASI	IASI-NG
Wavelength (cm^{-1})	[645;2645]	Same
Channel Number	8 461	16 921
Spectral Sampling (cm^{-1})	0.25	0.125

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IASI-NG			

Instrumental Noise



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- OSSE
- Results



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Introdu	ıction
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OSSE

Simulation of IASI and IASI-NG

Impact of Number of Channel Asimilated O OO OOO

OSSE

We want to assimilate Radiance for Ozone in an hourly 3D-Var Method; on the month of June 2019

- Nature Run (NR) :
 - Represents our true state
 - Assimilation of 34 IASI Ozone Channels
- Control Run (CR) :
 - No Data assimilation
 - Different Emissions than NR

Assimilation Run

Assimilation, with CR configuration, of Observations simulated from the NR. For IASI and IASI-NG

- Simulation of Observations, from NR using RTTOV
- 2 Add the Instrumental Noise
- Assimilate the Simulated Observations with noise in the CR space
- Using a Diagnosticated R Matrix for the assimilation

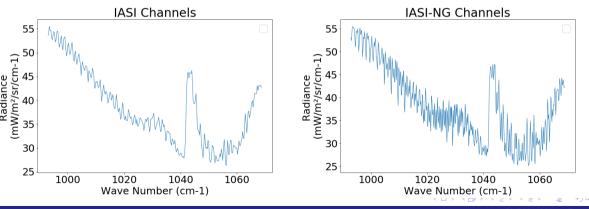
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Introduction	Simulation of IASI and IASI-NG	Impact of Number of Channel Asimilated	Conclusion
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Results			

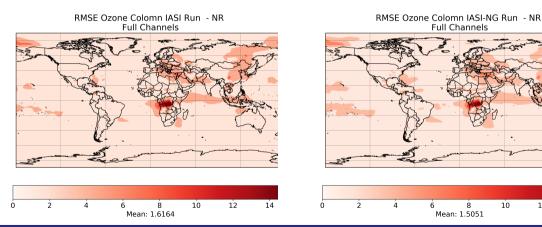
Exemple of simulated spectra



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Score RMSE Total Ozone Column (DU)



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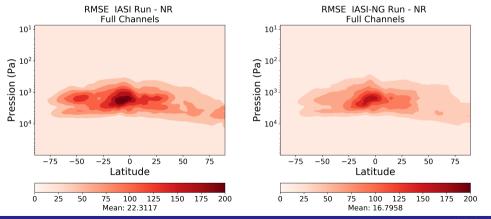
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Results			

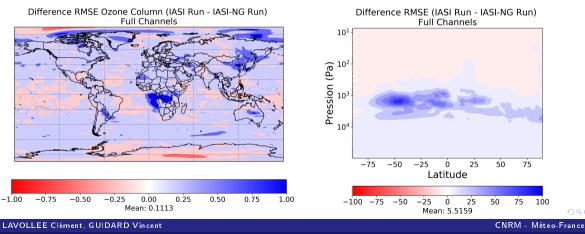
Score RMSE Vertical Section (ppbv)



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Results			

Comparison Score RMSE



l ntroduction 0 00	Simulation of IASI and IASI-NG	Impact of Number of Channel Asimilated 0 00	Conclusion 000000
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Results			

Computing Time

Computing time for One Day :

- IASI 304 Channels : 2 hours elapsed time on 8 nodes
- IASI-NG 609 Channels : 4 hours elapsed time on 8 nodes

Comments

- IASI-NG provides better scores than IASI
- IASI assimilation is faster because we assimilate less channels than for IASI-NG.
- To reduce the assimilation time we decided to reduce the number of channels.

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2) Simulation of IASI and IASI-NG

Impact of Number of Channel Asimilated

- Selections
- Comparison

4 Conclusion

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Selections			

We make a channel selection from the previous selection for IASI and IASI-NG. Based on the Degree of Freedom for Signal.

First we classify Channels with their impact on the DFS of Ozone

Instrument	Full DFS	Number of Channel	75% DFS
		for DFS 75 %	
IASI	0.976	70	0.732
IASI-NG	1.980	90	1.485

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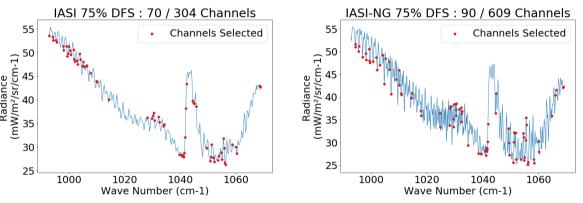
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Selections			

For IASI and IASI-NG we made a new selections. 75% of total DFS.



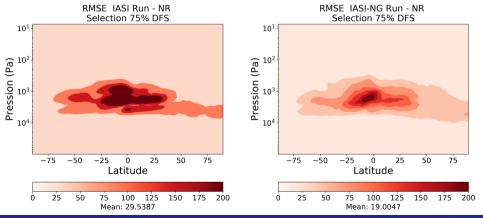
We create new Assimilation Runs with these selections.

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Comparison			

Score RMSE Vertical Section (ppbv) Selection Runs



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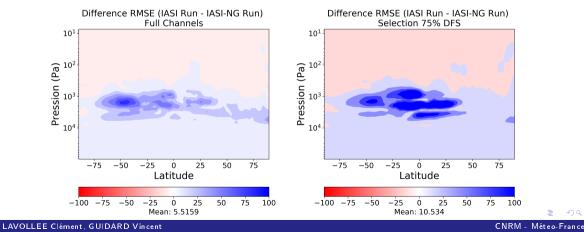
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Comparison		

Conclusion 000000

Comparison Score RMSE (ppbv) Ozone Column



Introduction	Simulation of IASI and IASI-NG	Impact of Number of Channel Asimilated	Conclusion
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		00 000	
Comparison			

Mean on the Field of RMSE Score

Selection	IASI	IASI-NG	Gain (Percent)
Full	22.312	16.796	24.7
75 % DFS	29.539	19.005	35.6

Computing Time (hour)

Selection	IASI	IASI-NG
Full	2 :00	4 :00
75 % DFS	1 :15	2:45

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- IASI-NG Radiances will be assimilated for Ozone
- IASI-NG will improve the quality of Ozone Analysis compare to IASI
- It will be possible to chose a little number of Channel to reduce the computing time

The Next step is to extend to more species as CO or some aerosols

I ntroduction O OO	Simulation of IASI and IASI-NG o occoo	Impact of Number of Channel Asimilated o oo 000	Conclusion 00●000

Thank You For Your Attention Some Questions?

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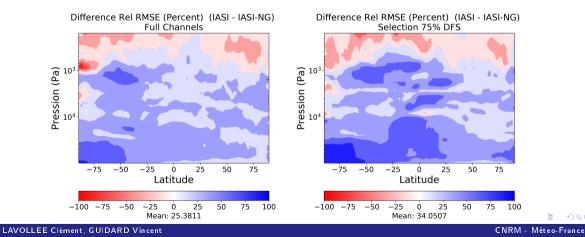
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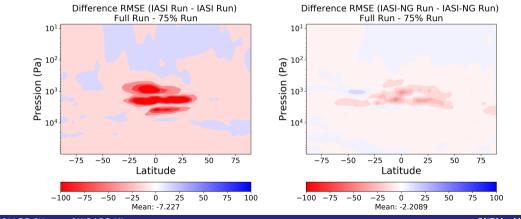
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Relative Difference







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Relative Difference

