

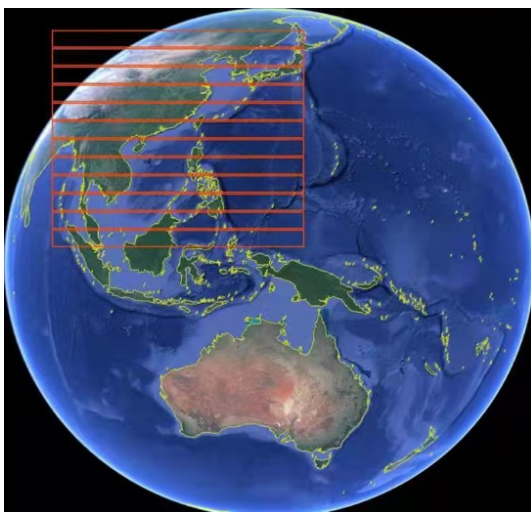
Offre de Stage IPSL 2024

(Soutenu par le programme EUR IPSL-Climate Graduate School)

Titre du sujet de stage : AI retrievals of Land Surface Temperatures over China

Description du sujet (1 page maximum) :

The Geostationary Interferometric Infrared Sounder (GIIRS) is an infrared hyper-spectral space-borne interferometer that flies in geostationary orbit to take measurements of three dimensional atmospheric structure over East Asia, and in particular China (figure 1).



Over China, there are measurements every hour on average, at 8km resolution. At LATMOS, we work on the IASI instrument, an infrared sounder, similar to GIIRS but in polar orbit (crosses the same location two times per day). We have developed for IASI a dedicated Land Surface Temperature product (<https://iasi-ft.eu/products/skt/>), that we would like to adapt and enhance to GIIRS.

Figure 1. GIIRS sounding area

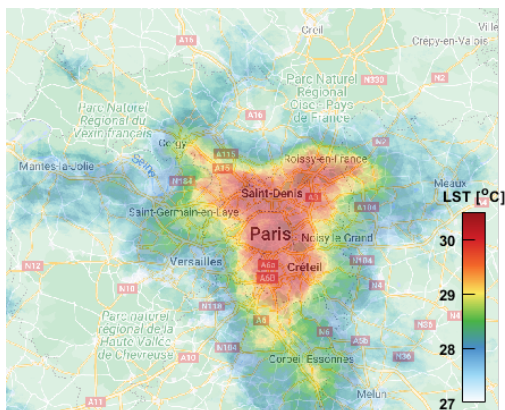


Figure 2. LST from IASI over Paris in Summer

Land Surface Temperature (LST, example over Paris shown on Figure 2) is an essential climate variable, and is typically measured by infrared sounders. It is particularly important when studying Urban Heat Islands, a typical phenomenon that occurs in cities where the urban surface is hotter than the surrounding.

GIIRS, an infrared sensor, measures the Earth's infrared radiation leaving the surface into the atmosphere and reaching the sensor. In parts of the infrared spectrum where little other gases/molecules

absorb, we can get information on the radiation (aka heat or temperature) of the surface/land.

With GIIRS we will be able to study the urban heat island effect over China, but more importantly how it evolves through the day.

Description of the internship work

The objective of this internship is to explore existing AI methods and develop new ones to calculate land surface temperatures from the raw data of GIIRS (radiance). We have developed a Tskin/LST product at LATMOS based on neural networks trained with reanalysis data (<https://www.mdpi.com/2072-4292/12/17/2777>). For this internship, a similar AI approach, based on neural networks or a machine learning approach will be used and adapted to GIIRS. The objectives are:

- Examine and explore the differences between the IASI and GIIRS spectra
- Investigate the existing LST retrieval codes and adapt them to GIIRS. Develop new approaches based on different methods if needed.
- Retrieve LST from GIIRS over at least one season (summer for example)
- Study the Urban Heat Island effect from GIIRS and its diurnal variability

Responsable du stage (Nom/prénom/statut) :

Sarah Safieddine (Chargée de recherche, sarah.safieddine@latmos.ipsl.fr)

Laboratoire concerné :

LATMOS ([Laboratoire Atmosphères, Milieux, Observations Spatiales](#))

Adresse à laquelle a lieu le stage :

LATMOS, Tour 45, couloir 45-46, Sorbonne Université, [4 Place Jussieu](#) 75252 Paris Cedex 05

Equipe de recherche concernée (si pertinent) ou autre participant à l'encadrement du stage :

L'équipe Tropo, et plus particulièrement la sous équipe « IASI ». Cathy Clerbaux va participer à l'encadrement de ce stage.

Niveau du stage (Licence, M1, M2, *internship*) :

M2

Licence ou Master(s) où sera proposé le sujet : Master parcours DAC - SU

Thème scientifique de l'IPSL concerné : Climat urbain/IA

Durée du stage : 4 à 6 mois (flexible)

Période : Flexible à partir de fév/mars 2024

Rémunération de l'ordre de 580 euros par mois.

Est-il prévu une thèse dans le prolongement du stage ?

Oui, financement ED129