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Measurement and Variation of the Downward Longwave Radiation (Rld) in Humid Tropical Area (Guadeloupe).

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The thermal longwave downward radiation emitted by atmospheric constituents is a main component of the radiation budget at the soil surface, and is directly related to greenhouse effect.

An accurate estimate of this infrared radiation is required in agronomy and forestry sciences.

Direct measurements are complex and unusual in mid-latitude countries and are nearly non-existent in tropical regions. Classical estimating formulae (Ångström 1915, Brunt 1932, Brutsaert 1975, etc.) have not been calibrated for the humid tropics.

Radiation measurements

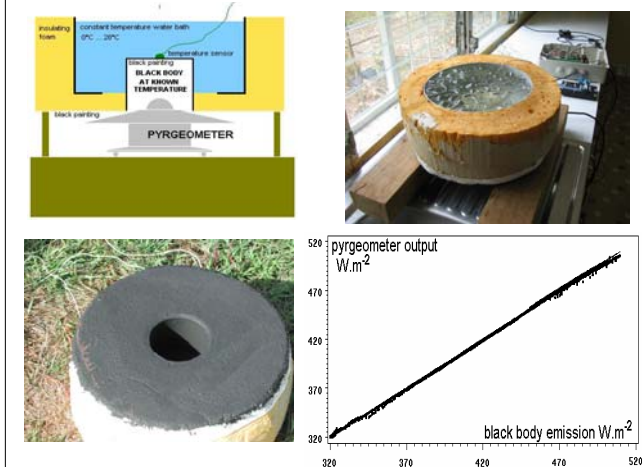
Atmospheric long wave radiation over Guadeloupe was measured during years 2003 to 2005. A "Pyrgometer" (Precision Infrared Radiometer, Eppley Laboratory Inc.), a special radiation sensor using a silicon hemispheric filter transparent to thermal infrared radiation, was used.

Pyrgometer and radiation sensors on field



This sensor was carefully calibrated against a reference black body build in our laboratory

Calibration in laboratory

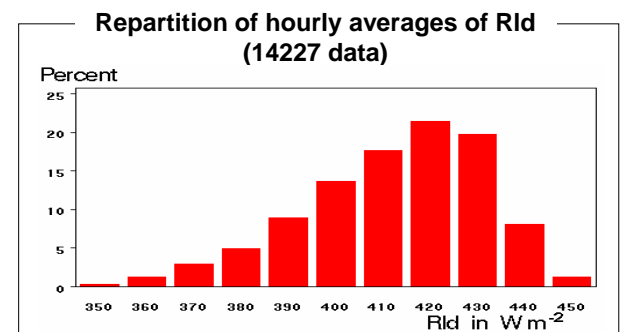
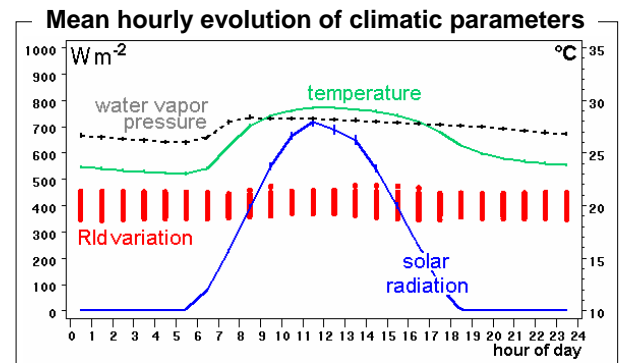


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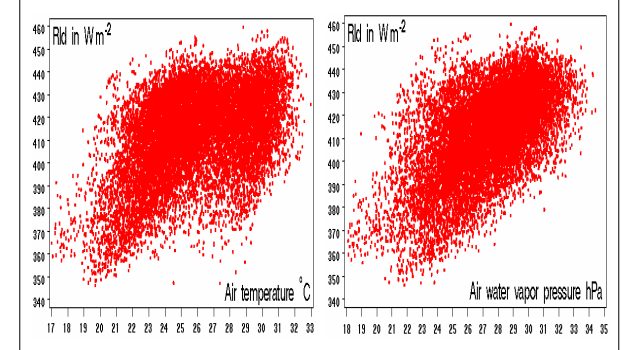
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Main results

Longwave downward radiation (Rld) data were compared to simultaneous climatic records for testing daily and annual evolution.



Hourly averages of Rld versus climatic parameters



Conclusion

The tropical atmospheric thermal infrared radiation :

→ has always a high value in Guadeloupe : 350 to 450 $W.m^{-2}$ (compared to about 150 $W.m^{-2}$ for mid-latitude clear atmospheres),

→ corresponds to an atmospheric equivalent black- body emission from 7 to 25°C (compared to - 20°C),

→ has a very small daily and annual variation.

