Development of a new Solar Radiance-To-Flux Conversion to Improve SW Flux Estimations

–final presentation–

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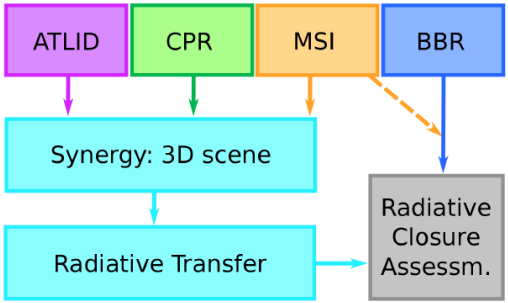
March 10, 2021

Introduction

- EarhtCare's **Radiative closure** successful if $\boldsymbol{\Delta F} = F_{RT}$-$F_{BBR}$ within $\pm$ 10 Wm^2



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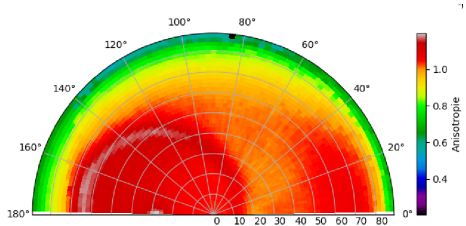

SW radiance angular dependency of an overcast scene with $\tau = 12$

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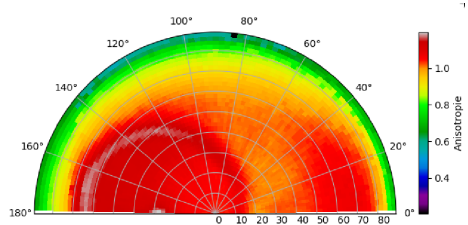

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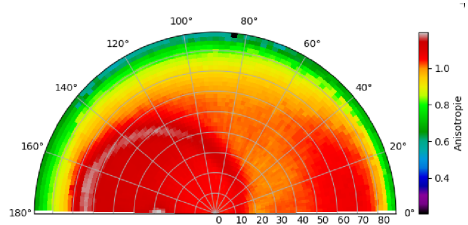

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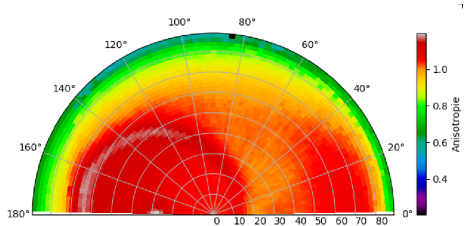

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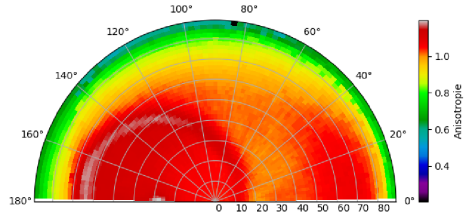
  - **State-of-art** sigmoidal approach is a function of τ, f and w_{10m}
  - **lack** of important **dependencies** of e.g. **cloud micro-physics**



SW radiance angular dependency of an overcast scene with $\tau = 12$

New semi-physical log-linear approach

- Incorporated **additional dependencies** of SW radiance to cloud micro-physics (via $\boldsymbol{R_{eff}}$)

$$\log I(\theta_s, \theta_v, \phi) \sim \log S_0 + \log \alpha - 2 \cdot CTWV$$

S_0 = solar constant
α = footprint albedo
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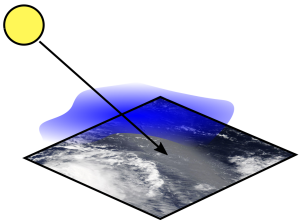

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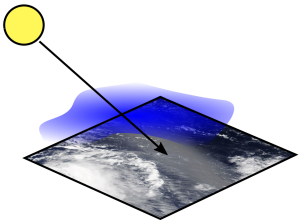

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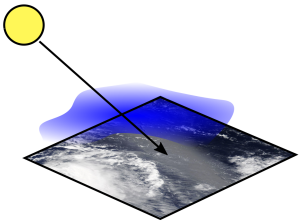

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- **Footprint albedo** $\alpha(f, w_{10}, \tau, R_{eff})$ is calculated using **two-stream theory**

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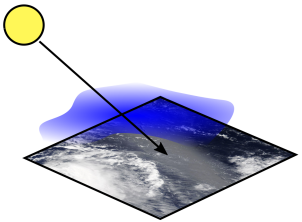
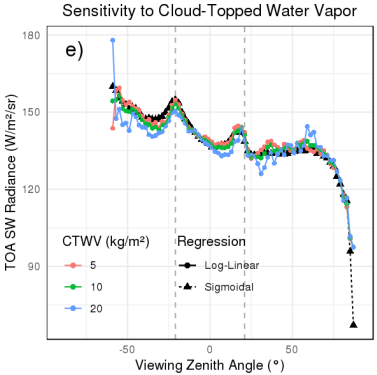
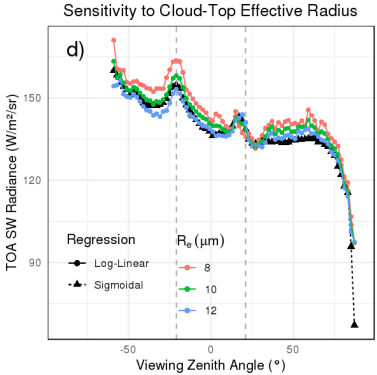


Results





$CTWV$-sensitivity along the PP $\theta_S = 21°$, **?**

R_{eff}-sensitivity along the PP $\theta_S = 21°$, **?**

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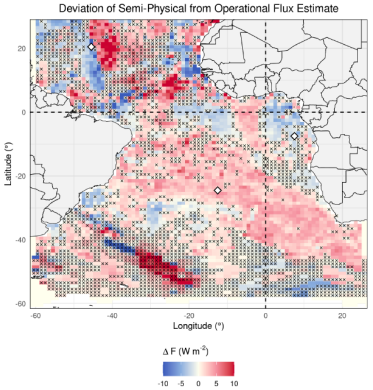
- **Instantaneous flux deviations** of up to $\pm 25\ W/m^2$ when applied to CERES-MODIS and GERB-SEVIRI observations of **marine clouds**



Daily flux of log-linear minus operational approach for July 11th 2007 **?**

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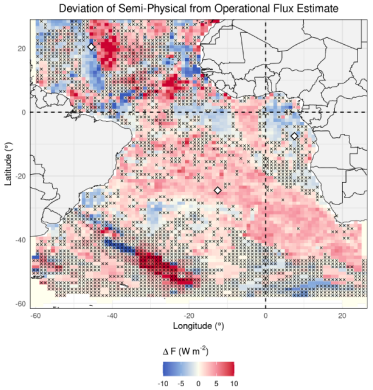

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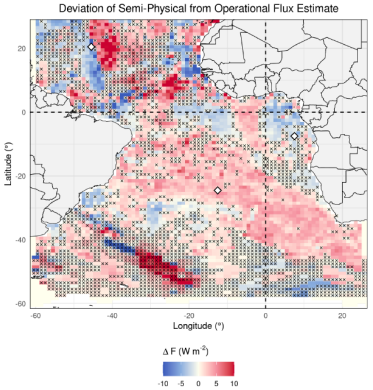

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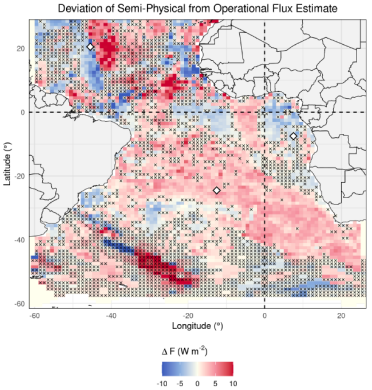
- Deviations can propagate to **daily means** (up to $\pm 10\ W/m^2$)
- and **monthly means** (up to $\pm 5\ W/m^2$)



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Thank You For Your Attention!