Separación de Directa y Difusa a Escala Minutal

Fundamentos del Recurso Solar
2024

Laboratorio de Energía Solar
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DIAGRAMA fd vs kt A ESCALA MINUTAL

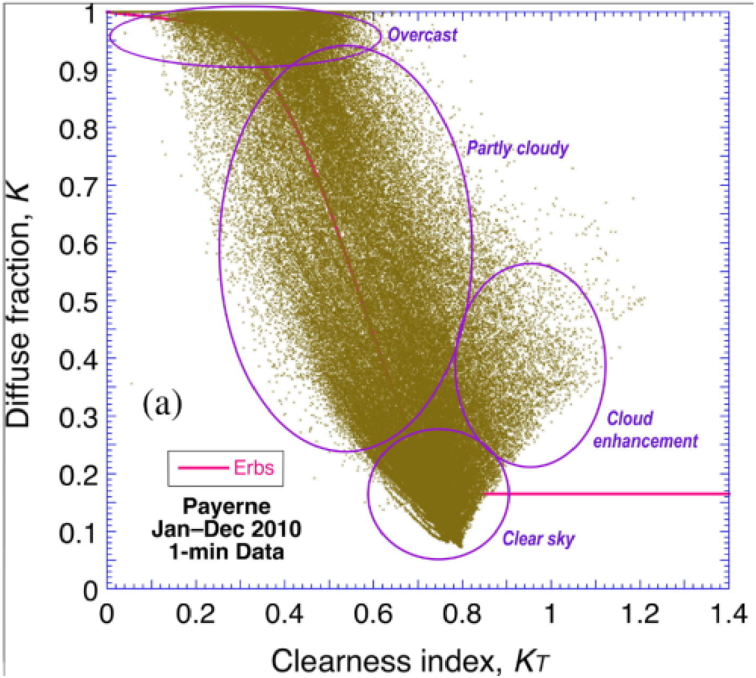
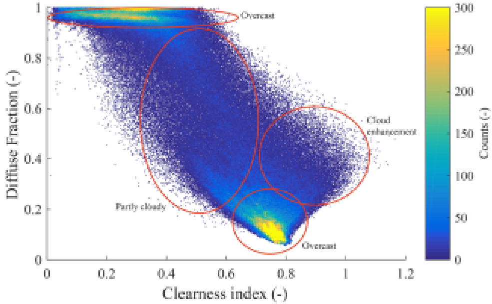
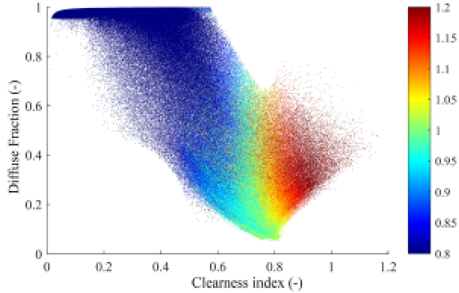


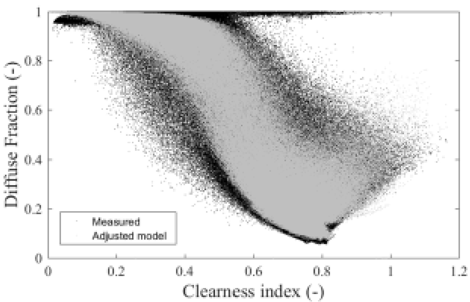
DIAGRAMA fd vs kt A ESCALA MINUTAL



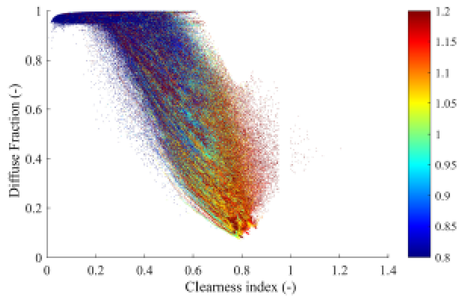
(a)



(a) Florianopolis/Brazil



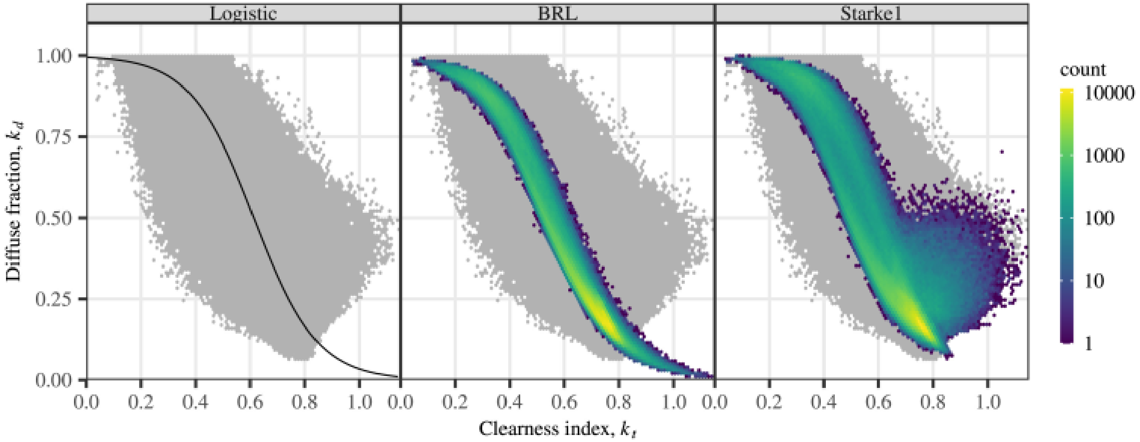
(b)

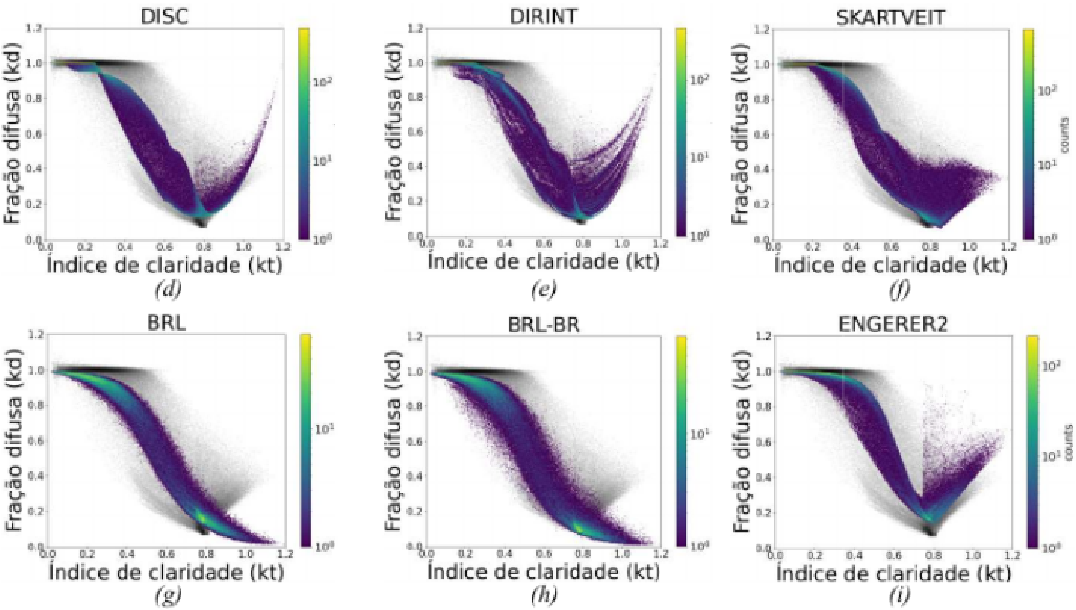


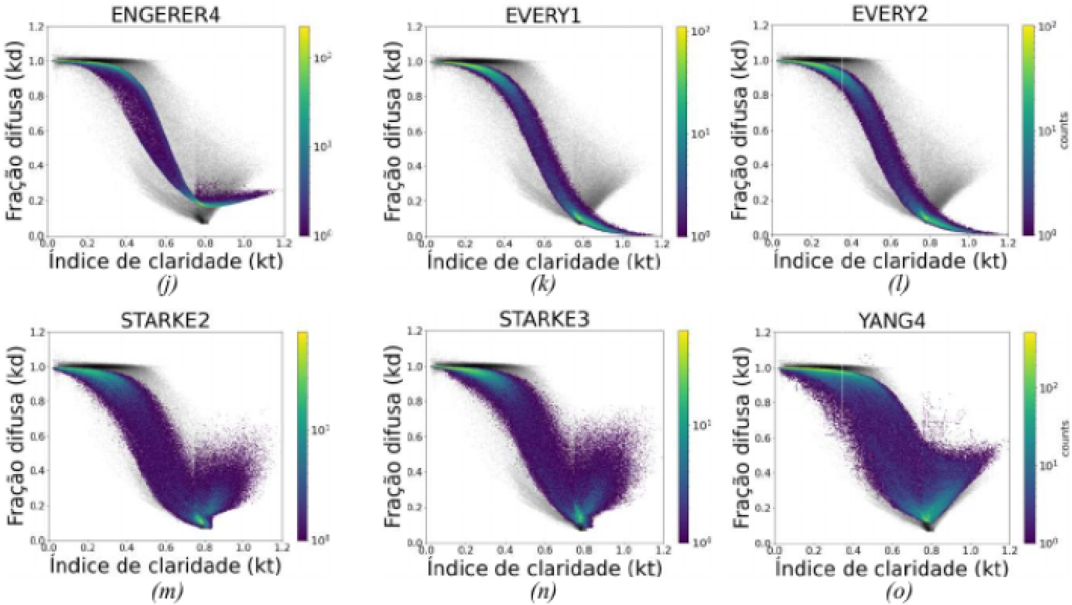
(b) Xianghe/China

SEPARACIÓN DIRECTA-DIFUSA MINUTAL:

- Problema significativamente más complejo.
- Requiere incorporar otras variables al modelado.




DISC
DIRINT
SKARTVEIT
BRL
BRL-BR
ENGERER2
Fração difusa (kd)
Índice de claridade (kt)
counts
(d)
(e)
(f)
(g)
(h)
(i)


ENGERER4
EVERY1
EVERY2
STARKE2
STARKE3
YANG4
Fração difusa (kd)
Índice de claridade (kt)
counts
(j)
(k)
(l)
(m)
(n)
(o)

LES

VARIABLES DE ENTRADA UTILIZADAS EN LOS DIFERENTES MODELOS

Artículos interesantes (en EVA)

- Gueymard & Ruiz-Arias (2016)
- Starke et al. (2021)
- Yang (2022)
- F. F. de Medeiros et al. (2022)

Modelo YANG4

$$k_d^{\mathrm{YANG4}} = C + \frac{1-C}{1+e^{\beta_0+\beta_1 k_t+\beta_2 \mathrm{AST}+\beta_3 Z+\beta_4 \Delta k_{tc}+\beta_6 k_{d,\mathrm{hourly}}^{\mathrm{ENGERER2}}}} + \beta_5 k_{de}$$

Modelo ENGERER2

$$k_d^{\mathrm{ENGERER2}} = C + \frac{1-C}{1+e^{\beta_0+\beta_1 k_t+\beta_2 \mathrm{AST}+\beta_3 Z+\beta_4 \Delta k_{tc}}} + \beta_5 k_{de}$$

Modelo STARKE3

$$k_d^{\mathrm{STARKE3}} = \begin{cases} \frac{1}{1+e^{\beta_0+\beta_1 k_t+\beta_2 \mathrm{AST}+\beta_3 \alpha+\beta_4 k_{t,\mathrm{daily}}+\beta_5 \psi+\beta_6 G_{\mathrm{csky}}+\beta_7 k_{t,\mathrm{hourly}}}}, & \kappa \geq 1.05 \text{ and } k_t > 0.75; \\ \frac{1}{1+e^{\beta_8+\beta_9 k_t+\beta_{10} \mathrm{AST}+\beta_{11} \alpha+\beta_{12} k_{t,\mathrm{daily}}+\beta_{13} \psi+\beta_{14} G_{\mathrm{csky}}+\beta_{15} k_{t,\mathrm{hourly}}}}, & \text{otherwise,} \end{cases}$$

Table 1. Various input parameters as required by different separation models.

Parameter	Calculation method	Interpretation
G_{csky}	McClear clear-sky model	Clear-sky GHI
Z	Compute via solar positioning	Solar zenith angle in degrees
α	$90^\circ - Z$	Solar elevation angle in degrees
AST	Compute via solar positioning	apparent solar time
k_t	G_h/E_0	Clearness index
$k_{t,\mathrm{daily}}$	Average k_t over a day	Low-frequency k_t signal, a form of variability index
$k_{t,\mathrm{hourly}}$	Average k_t over an hour	Low-frequency k_t signal, a form of variability index
ψ	Three-point moving average of k_t	Low-frequency k_t signal, a form of variability index
k_{tc}	G_{csky}/E_0	Clearness index of clear-sky GHI
Δk_{tc}	$k_{tc} - k_t$	Difference between clearness index of clear-sky GHI and clearness index
k_{de}	$\max(0, 1 - G_{\mathrm{csky}}/G_h)$	Portion of the diffuse fraction that is attributable to cloud enhancement events
κ	G_h/G_{csky}	Clear-sky index for GHI
$k_d^{(s)}$	Retrieve from satellite-derived irradiance database	Half-hourly or hourly satellite-derived diffuse fraction
$k_{d,\mathrm{hourly}}^{\mathrm{Engerer2}}$	Apply Engerer2 on hourly G_h	Hourly diffuse fraction estimate from Engerer2, which is a form of variability index

PRÓXIMA CLASE ...
MODELOS DE TRANSPOSICIÓN A PLANO INCLINADO

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