T_{atm}

$$T_{\mathrm{emi}}$$

1,2

1

$$J(\nu, T)$$

ν

T

T^{RJ}

$$k_{\text{bolt}}\,T^{\text{RJ}} = J(\nu, T).$$

$$T^{\mathrm{RJ}} = T$$

$$h\nu << k_{\mathrm{bolt}}\, T$$

$$h\nu >> k_{\mathrm{bolt}}\, T$$

C

$$C = c_{\text{dark}} + g\,(T_{\text{ant}}^{\text{tot}} + T_{\text{rec}}),$$

c_{dark}

g

$$T_{\mathrm{rec}}$$

$$T_{\mathrm{ant}}^{\mathrm{tot}}$$

$$T_{\rm ant}^{\rm tot} = \frac{T_{\rm ant}^{\rm sig} + G_{\rm im}\, T_{\rm ant}^{\rm ima}}{1 + G_{\rm im}},$$

$$T^{\mathrm{sig}}_{\mathrm{ant}}$$

$T^{\text{ima}}_{\text{ant}}$

G_{im}

g_{sig}

$$g_{\mathrm{ima}}$$

T_{ant}

$$T_{\text{loss}}$$

$$T_{\mathrm{astro}}$$

$$T_{\mathrm{ant}} = F_{\mathrm{eff}}\ \left[T_{\mathrm{atm}} \exp(-a\tau) + T_{\mathrm{astro}}\right] + (1 - F_{\mathrm{eff}})\, T_{\mathrm{loss}}$$

$$F_{\text{eff}}$$

τ

a

$$a = 1/\sin(\text{elevation});$$

T_{cab}

T_{amb}

$$T_{\text{loss}} = \alpha T_{\text{cab}} + (1 - \alpha) T_{\text{amb}},$$

α

T_{sky}

$$T_{\mathrm{emi}}^{\mathrm{tot}}$$

$$T_{\mathrm{sky}} = F_{\mathrm{eff}} T_{\mathrm{emi}}^{\mathrm{tot}} + (1 - F_{\mathrm{eff}}) T_{\mathrm{loss}}.$$

$$T_{\rm emi}^{\rm tot} = \frac{T_{\rm emi}^{\rm sig} + G_{\rm im}\, T_{\rm emi}^{\rm ima}}{1 + G_{\rm im}},$$

$$T_{\mathrm{emi}}^{\mathrm{sig}} = T_{\mathrm{atm}}^{\mathrm{sig}} \left\{1 - \exp\left(-a\tau_{\mathrm{sig}}\right)\right\} \quad \text{and} \quad T_{\mathrm{emi}}^{\mathrm{ima}} = T_{\mathrm{atm}}^{\mathrm{ima}} \left\{1 - \exp\left(-a\tau_{\mathrm{ima}}\right)\right\}.$$

$$\tau = \tau_{\mathrm{dry}} + \tau_{\mathrm{wet}},$$

τ_{dry}

τ_{wet}

w_{H_2O}

$$\tau_{\mathrm{wet}} = \alpha_{\mathrm{H_2O}}\, w_{\mathrm{H_2O}}$$

$$\alpha_{\mathrm{H_2O}}$$

$$\frac{T_{\rm hot}-T_{\rm sky}^{\rm tot}}{C_{\rm hot}-C_{\rm sky}^{tot}}=\frac{T_{\rm hot}-T_{\rm cold}}{C_{\rm hot}-C_{\rm cold}},$$

T_{hot}

T_{cold}

C_{hot}

C_{cold}

$$T_{\rm sky}^{\rm tot}$$

$$T_{\mathrm{a}}^{\star} = T_{\mathrm{cal}} \frac{C_{\mathrm{on}} - C_{\mathrm{off}}}{C_{\mathrm{hot}} - C_{\mathrm{off}}},$$

T_{cal}

T_{cal}

$=$

$$(1 + G_{\mathrm{im}})\ \left[T_{\mathrm{emi}}^{\mathrm{sig}} - T_{\mathrm{bg}}\right]$$

+

$$(1 + G_{\mathrm{im}}) \left[T_{\mathrm{loss}} - T_{\mathrm{emi}}^{\mathrm{sig}} \right] \exp(a\tau_{\mathrm{sig}})$$

$$G_{\rm im}\left[T^{\rm sig}_{\rm emi} - T_{\rm bg}\right]\left[\exp\left\{a(\tau_{\rm sig} - \tau_{\rm ima})\right\} - 1\right]$$

$$\frac{1 + G_{\mathrm{im}}}{F_{\mathrm{eff}}} \; [T_{\mathrm{hot}} - T_{\mathrm{loss}}] \, \exp(a\tau_{\mathrm{sig}}).$$

$$T_{\mathrm{bg}}$$

$$T_{\mathrm{emi}}^{\mathrm{sig}}$$

$$T_{\mathrm{cal}} = (T_{\mathrm{hot}} - T_{\mathrm{sky}}) \frac{1 + G_{\mathrm{im}}}{F_{\mathrm{eff}} \; \exp\left(-a\tau_{\mathrm{sig}}\right)}.$$

$T_{\mathrm{a}}^{\star}$

H_2O

O_2

O_3

2

$$1 - \exp(-a\tau)$$

$$T_{\rm emi} \propto T_{\rm atm}\ [1 - \exp(-a\tau)]$$

$$T_{\mathrm{cal}} \propto \exp(a\tau)$$

$$\exp(-a\tau)$$

$$(T_{\mathrm{hot}} - T_{\mathrm{sky}})$$

$$[1+G_{\mathrm{im}}]\,/\,[F_{\mathrm{eff}}\ \exp{(-a\tau)}]$$

τ_{true}

$$G_{\mathrm{im}}^{\mathrm{true}}$$

$$F_{\mathrm{eff}}^{\mathrm{true}}$$

$$T_{\mathrm{cal}}^{\mathrm{true}}$$

τ_{mod}

$$G_{\mathrm{im}}^{\mathrm{meas}}$$

$$F_{\mathrm{eff}}^{\mathrm{meas}}$$

$$T_{\mathrm{cal}}^{\mathrm{meas}}$$

$$\frac{T_{\mathrm{cal}}^{\mathrm{meas}} - T_{\mathrm{cal}}^{\mathrm{true}}}{T_{\mathrm{cal}}^{\mathrm{true}}} = \frac{F_{\mathrm{eff}}^{\mathrm{true}}(1 + G_{\mathrm{im}}^{\mathrm{meas}})}{F_{\mathrm{eff}}^{\mathrm{meas}}(1 + G_{\mathrm{im}}^{\mathrm{true}})} \exp\left[a(\tau_{\mathrm{mod}} - \tau_{\mathrm{true}})\right] - 1$$