T_{EM}

T_{CHOP}

T_{COLD}

$$T_{\mathrm{AMB}}$$

η_{F}

$$C_{\mathrm{SKY}} = K(T_{\mathrm{R}} + (1 - \eta_{\mathrm{F}})T_{\mathrm{AMB}} + \eta_{\mathrm{F}}T_{\mathrm{EM}})$$

$$C_{\mathrm{CHOP}} = K(T_{\mathrm{R}} + T_{\mathrm{CHOP}})$$

$$C_{\mathrm{COLD}} = K(T_{\mathrm{R}} + T_{\mathrm{COLD}})$$

T_{R}

$$T_{\mathrm{SYS}} = \frac{T_{\mathrm{R}} + (1 - \eta_{\mathrm{F}}) T_{\mathrm{AMB}}}{\eta_{\mathrm{F}}} + T_{\mathrm{EM}} = T_{\mathrm{LOSS}} + tem$$

$$\Delta T_{\mathrm{EM}}$$

ΔP

P

$$\Delta P/P = (\Delta T_{\mathrm{EM}} + \Delta T_{\mathrm{LOSS}})/T_{\mathrm{SYS}}$$

T_{LOSS}

$$T_{\mathrm{EM}}(observed) = (T_{\mathrm{EM,S}}(w_{\mathrm{H_2O}}) + GT_{\mathrm{EM,I}}(w_{\mathrm{H_2O}}))/(1+G)$$

$$T_{\mathrm{EM,S}}$$

$T_{\mathrm{EM,I}}$

l

$\omega_{\mathrm{H_2O}}$

$$\frac{\partial l}{\partial T_{\mathrm{EM}}}$$

$$\phi(t) = \frac{2\pi}{\lambda} l(t)$$

$\phi(t)$

$$T_{\mathrm{EM}}(t_0)$$

$$l(t_0)$$

$\partial l / \partial T_{\mathrm{EM}}(t_0)$

$$\Delta T_{\mathrm{EM}}(t) = T_{\mathrm{SYS}} \frac{\Delta P(t)}{P} + \Delta T_{\mathrm{LOSS}}(t)$$

$$\Delta\phi(t) = \frac{2\pi}{\lambda}\frac{\partial l}{\partial T_{\mathrm{EM}}}\left(T_{\mathrm{SYS}}\frac{\Delta P(t)}{P} + \Delta T_{\mathrm{LOSS}}(t)\right)$$

$$\Delta\phi(t) = \frac{2\pi}{\lambda} \frac{\partial l}{\partial T_{\mathrm{EM}}} \frac{T_{\mathrm{SYS}}(t_0)}{P(t_0)} \left(P(t) - P_{\mathrm{REF}}(t)\right)$$

$$P_{\mathrm{REF}}(t)$$

$$\Delta T_{\mathrm{LOSS}}(t)$$

$1-4$

$$P(t)$$

$$\Delta T_{\mathrm{LOSS}}$$

F

$$\Delta\phi(t) = F\left(P(t) - P_{\mathrm{REF}}(t)\right)$$

uv