V Luminances spectrales ↑ à la verticale

émergeant en h^t de l'atmosphère en IR tellurique

Télédétection passive en satellite visant au nadir

$L^{\uparrow}_{\nu}(z=\infty, \theta=0)$ $\qquad \tau_\nu(z=\infty)=0$ $\qquad J_\nu = B_\nu(T)$

$$L_\nu = B_\nu(T_S)\, T_\nu(z=0) + \int_{z=0}^{\infty} B_\nu(T(z)) \frac{\partial T_\nu(z)}{\partial z}\, dz$$

$W_\nu(z)$

T_S : temp. de la surface

$\tau_\nu(z) =$ entre z et $z=\infty$

$T_\nu(z) = e^{-\tau_\nu(z)}$ $\qquad T_\nu(\infty) = 1 \quad \forall \nu$

$A_\nu(z) = 1 - T_\nu(z)$ $\qquad A_\nu(\infty) = 0 \quad \forall \nu$

$W_\nu(z) = \frac{\partial T_\nu}{\partial z}$ $\qquad$ fct poids

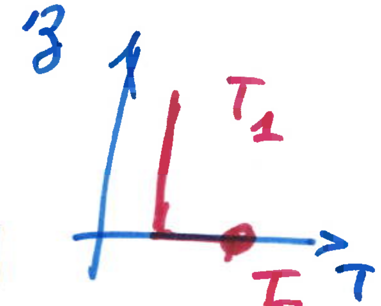
$T_{\text{brillance}}(\nu)$ t.q. $L_\nu = B_\nu(T_{\text{Brill}}(\nu))$

L_ν = fct$(T_S$, profil $T(z)$, profil transm $\mathcal{T}_\nu(z))$

* tellurique : absorption saturée $\mathcal{T}_\nu(0) = 0$
  sauf dans les fenêtres ⟹ L_ν indpt de T_S
* [8–12 μm] hors O_3 à 9,6 μm
  $\mathcal{T}_\nu(0) \simeq 1 \Rightarrow L_\nu = B_\lambda(T_S)$ $\quad T_B(\nu) = T_S$

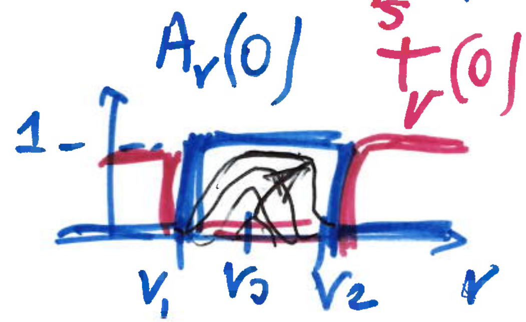
Modèles atmosphériques très élémentaires

① thermique — surface T_S, atmosphère isotherme à T_1



② Transmission — atmosphère transparente sauf $[\nu_1, \nu_2]$ où $A_\nu(0) = 1$

$A_\nu(z)$ $\quad z \downarrow$



$$L_\nu = B_\nu(T_s)\, T_\nu(0) + \int_0^\infty \underbrace{B_\nu(T(z))}_{= T_1} \frac{\partial T_\nu}{\partial z}(z)\, dz$$

$$L_\nu = B_\nu(T_s)\left[1 - A_\nu(0)\right] + B_\nu(T_1)^{\text{isotherme}} \underbrace{\left[\underset{=1}{T_\nu(\infty)} - T_\nu(0) \right]}_{A_\nu(0)}$$

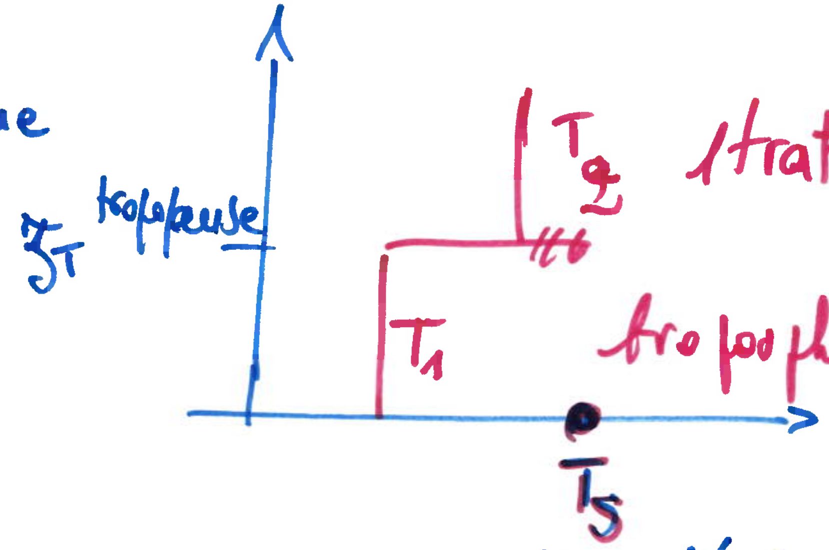
$$L_\nu = B_\nu(T_s) + A_\nu(0)\left[B_\nu(T_1) - B_\nu(T_s) \right]$$

hors absorption $\nu \notin [\nu_1, \nu_2]$ $\quad A_\nu(0) = 0 \quad L_\nu = B_\nu(T_s)$

dans la bande saturée $\nu \in [\nu_1, \nu_2]$ $\quad A_\nu(0) = 1 \quad L_\nu = B_\nu(T_1)$

Modèle 2

- thermique

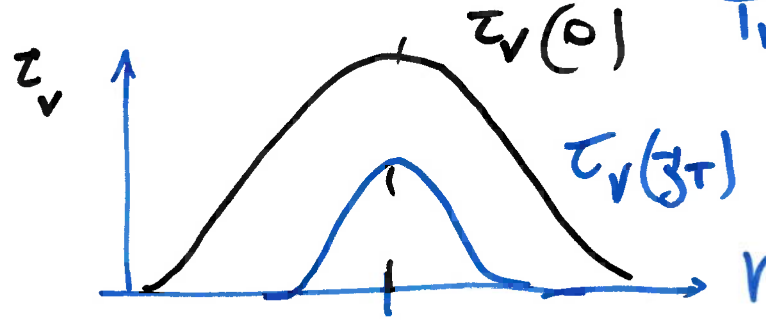


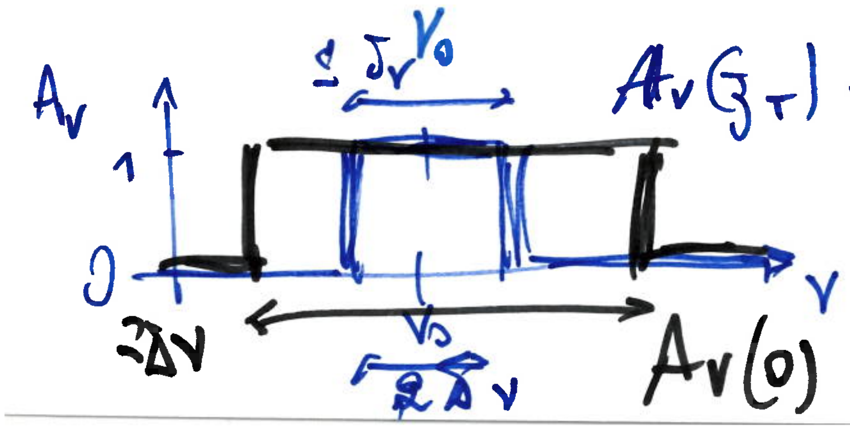
$T_1 < T_2 < T_S$

- Transmission

$T_\nu(0) = $ tte l'atmosphère

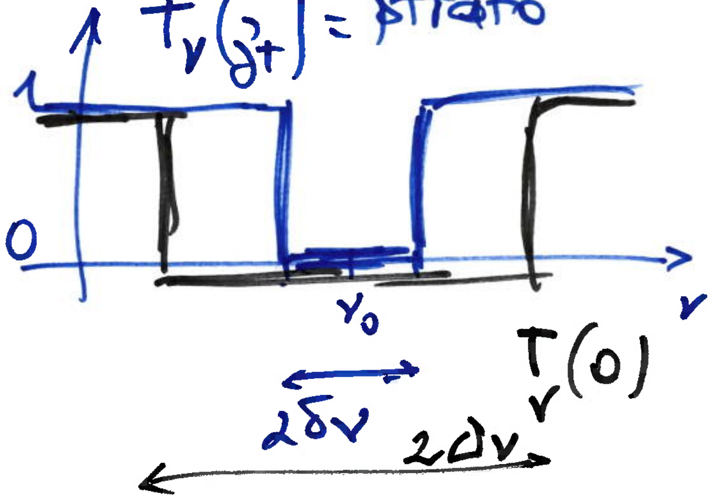
$T_\nu(z_T) = \exp[-\underbrace{\tau_\nu(z_T \to \infty)}_{\text{strato seulement}}]$





$A_\nu(z_T) = $ absorption strato

$A_\nu(0)$ tte l'atmosphère



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$$L_\nu = B_\nu(T_S)\, T_\nu(0) + B_\nu(T_1) \int_0^{z_T} \frac{\partial T_\nu}{\partial z}\, dz + B_\nu(T_2) \int_{z_T}^{\infty} \frac{\partial T_\nu}{\partial z}\, dz$$

$$L_\nu = B_\nu(T_S)\left[1 - A_\nu(0)\right] + B_\nu(T_1)\left[T_\nu(z_T) - T_\nu(0)\right] + B_\nu(T_2)\left[T_\nu(\infty) - T_\nu(z_T)\right]$$

$$\left[A_\nu(0) - A_\nu(z_T)\right] \qquad\qquad \underbrace{1 - A_\nu(z_T)}$$

$$L_\nu = B_\nu(T_S) + A_\nu(0)\underbrace{\left[B_\nu(T_1) - B_\nu(T_S)\right]}_{<0} + A_\nu(z_T)\underbrace{\left[B_\nu(T_2) - B_\nu(T_1)\right]}_{>0}$$

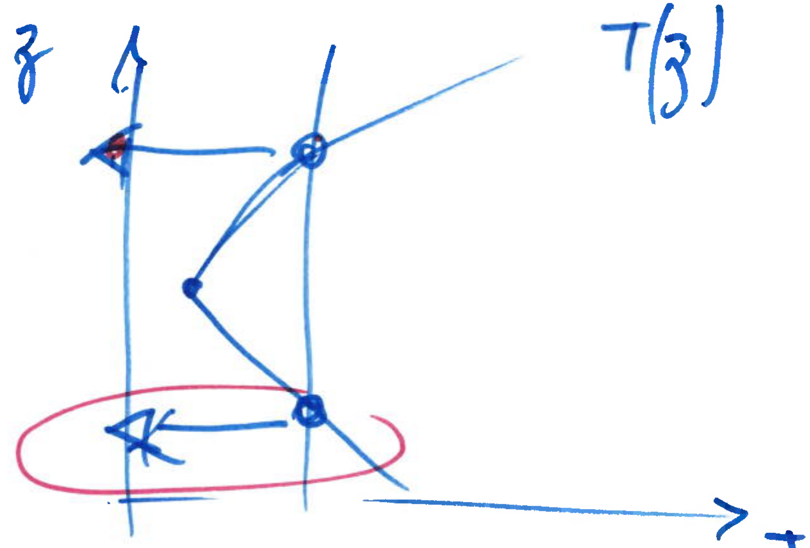
$T_1 < T_2 < T_S$

T_{Soleil}

$|\nu - \nu_0| > \Delta\nu \qquad A_\nu(0) = A_\nu(z_T) = 0 \qquad L_\nu = B_\nu(T_S) \qquad T_S$

$\delta\nu < |\nu - \nu_0| < \Delta\nu \qquad A_\nu(0) = 1$ mais $A_\nu(z_T) = 0 \qquad L_\nu = B_\nu(T_1) \qquad T_1$

$|\nu - \nu_0| \lesssim \delta\nu \qquad A_\nu(z_T) = A_\nu(0) = 1 \qquad L_\nu = B_\nu(T_2) \qquad T_2$


z
T(z)
T
236 K