0.1 Tires

Rolling Resistance

$$K_t = \begin{cases} 0.0085 + \frac{0.18}{p_t} + \frac{1.59*10^{-6}}{p_t} & : v_{kph} \leq 165(km/h) \\ \frac{0.18}{p_t} + \frac{2.91*10^{-6}}{p_t} & : v_{kph} > 165(km/h) \end{cases} \tag{1}$$

Wheel Slip

$$\kappa = \frac{v - \omega_t r_t}{v} \tag{2}$$

$$\mu_{t,gnd} = D_\kappa \sin(C_\kappa \arctan[B_\kappa \kappa - E_\kappa(B_\kappa \kappa - \arctan B_\kappa \kappa)]) \tag{3}$$

Load and Torque

$$\tau_t = \tau_g - \frac{F_{w,long}}{r_t} - \frac{F_b}{r_b} - K_t F_{w,n} v_{kph}^2 \tag{4}$$

Traction Limiting

$$F_{max} = \mu_{t,gnd} F_{w,n} \tag{5}$$

$$F = \tau r_t \tag{6}$$

$$F_t = \begin{cases} F & : -F_{max} \leq F \leq F_{max} \\ F_{max} & : -F_{max} > F > F_{max} \end{cases} \tag{7}$$

The tire coefficient ($\mu_{t,gnd}$) is modeled using the "Magic Formula" as shown below. Where D_κ is the maximum tire coefficient of the tire.

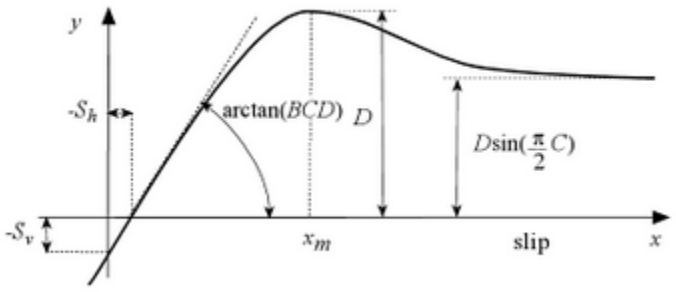

Figure 1: Magic Formula