Streaming Limit

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Shock Acceleration I

$$V_z \frac{\partial f_i}{\partial z} - \frac{\partial}{\partial z}\left(K_{i,zz} \frac{\partial f_i}{\partial z}\right) - \frac{1}{3}\frac{dV_z}{dz} v \frac{\partial f_i}{\partial v} = Q_i$$

$$\zeta(z) = \int_0^z [V/K_{zz}(z')]dz'$$

$$f(z>0,v) = f_0 - (f_0 - f_\infty)(1 - e^{-\zeta})(1 - e^{-\zeta_\infty})^{-1}$$

$$f_0 \equiv \beta \int_0^v \frac{dv'}{v'} f_\infty(v')(1 - e^{-\zeta'_\infty})^{-1} \left(\frac{v}{v'}\right)^{-\beta} \exp\left[-\beta \int_{v'}^v \frac{dv''}{v''} e^{-\zeta''_\infty}(1 - e^{-\zeta''_\infty})^{-1}\right]$$

Shock Acceleration II

$$-K_{zz}\left.\frac{\partial f}{\partial z}\right|_{z \to \infty} = V(f_0 - f_\infty)e^{-\zeta_\infty}(1 - e^{-\zeta_\infty})^{-1}$$

$$f(z \to \infty) = f_\infty + (V/v)(f_0 - f_\infty)e^{-\zeta_\infty}(1 - e^{-\zeta_\infty})^{-1}$$

$$f(\zeta_\infty \le 1, z \to \infty) = f_\infty + (V/v)(f_0 - f_\infty)\zeta_\infty^{-1}$$

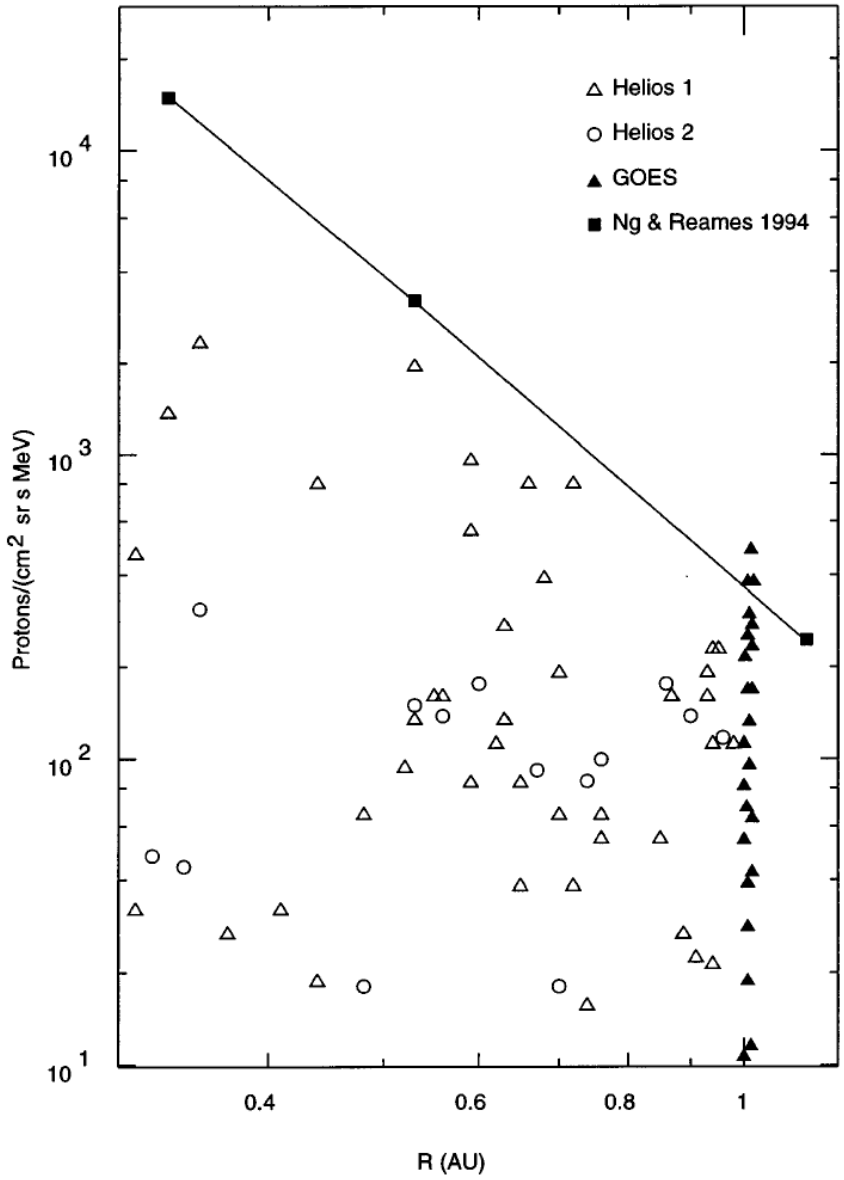
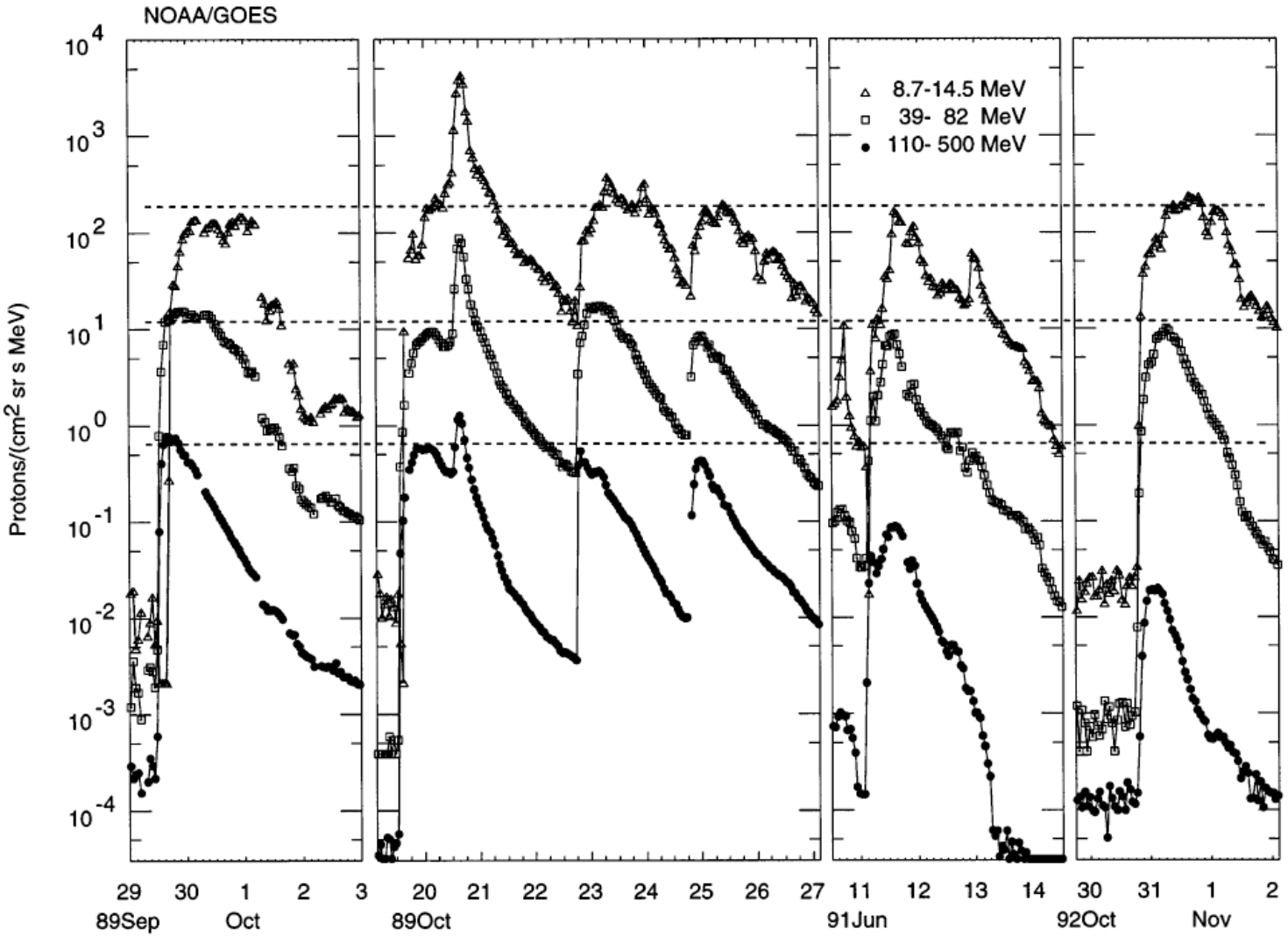


FIG. 3.—Radial gradient of the streaming-limited plateau intensities of 3–6 MeV protons from *Helios 1* and *2* and 4.2–8.7 MeV protons from the *GOES* spacecraft are compared with the calculated (Ng & Reames 1994) intensity gradient.

Streaming Limit

Reames and Ng, 1998

Large SEP Events



Reames and Ng, 1998