Distance to which NEOcam could detect Chelyabinsk meteor that hit Russia Feb. 2013

$r := \frac{20}{2}\cdot m$ radius of object, increased from 17 to 20 based on NOVA program

$T := 280\cdot K$ from our L1 orbit, we would view the sunlit side of the object as it approached the earth. This estimate assumes rapid rotation, it would be hotter still otherwise.

$F_8 := 10^{-13}\cdot\frac{erg}{cm^2\cdot sec}\cdot\frac{8\cdot\mu m}{c}$ $F_8 = 2.669\times10^{-4}\,Jy$ 5 sigma flux limit NEOcam, 6-10 um band

$F = \frac{\pi\cdot r^2}{d^2}\cdot .95\cdot B_\nu(\nu, T)$ Flux of object at distance d, 95% emissivity

$d := \sqrt{\frac{\pi\cdot r^2}{F_8}\cdot .95\cdot B_\nu\left(\frac{c}{8\cdot\mu m}, T\right)}$ $d = 0.079\,AU$ $d = 1.184\times10^{7}\,km$

cf. Lagrange L1 point is 1.5 million km from earth, confirming that NEOcam could have detected this object well (~ 45 days) before it hit earth!

$v := 18\cdot\frac{km}{sec}$ velocity when it hit Earth

$m := \frac{4}{3}\cdot\pi\cdot r^3\cdot 3\cdot\frac{gm}{cm^3}$ mass of rocky object, density an estimate. $m = 1.257\times10^{7}\,kg$

$\frac{1}{2}\cdot m\cdot v^2 = 0.497\,Mton$ *extremely* close to the 500 kton measurement of energy from infrasound.

$M_{sun} \equiv 2\cdot10^{33}\cdot gm$ $AU \equiv 1.5\cdot10^{13}\cdot cm$

$R_{sun} \equiv 7.0\cdot10^{10}\cdot cm$ $arcsec \equiv \frac{\pi}{180\cdot3600}\cdot rad$

$k \equiv 1.38\cdot10^{-16}\cdot erg\cdot K^{-1}$

$h \equiv 6.63\cdot10^{-27}\cdot erg\cdot sec$ $L_{sun} \equiv 3.9\cdot10^{33}\cdot\frac{erg}{sec}$ $pc \equiv AU\cdot\frac{rad}{\ldots}$

$ster \equiv 1$ dimensionless constant

$\mu m \equiv 10^{-6}\cdot m$ $W \equiv watt$ $sc \equiv 1.36\cdot10^{6}\cdot erg\cdot cm^{-2}\cdot sec^{-1}$ $pc = 3.094\times10^{18}\,cm$

$Angstrom := 10^{-8}\cdot cm$ $ly \equiv c\cdot yr$

$pc = 3.27\,ly$

$G \equiv 6.67\cdot10^{-8}\cdot erg\cdot\frac{cm}{gm^2}$ $\sigma \equiv 5.67\cdot10^{-5}\cdot erg\cdot cm^{-2}\cdot sec^{-1}\cdot K^{-4}$

$a \equiv \frac{4\cdot\sigma}{c}$

$A \equiv 6.022\cdot10^{23}$

$e\_ \equiv 1.602\cdot10^{-19}\cdot coul$ $e\_ = 4.803\times10^{-10}\,esu$ $eV \equiv e\_\cdot volt$

$m_H \equiv \frac{1\cdot gm}{A}$ $m_H = 1.661\times10^{-24}\,gm$ $eV = 1.602\times10^{-12}\,erg$

$m_e \equiv 9.109\cdot10^{-31}\cdot kg$ $\frac{h\cdot c}{1\cdot eV} = 1.241\,\mu m$

$Hz \equiv sec^{-1}$ $Jy \equiv 10^{-26}\cdot\frac{W}{m^2\cdot Hz}$

$B_\nu(\nu, T) \equiv \frac{2\cdot h\cdot\nu^3}{2}\cdot\frac{1}{\left(\frac{h\cdot\nu}{\ldots}\right)}$ Planck