

Determination of the Meteor Limiting Magnitude

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Meteoroids 2016

Purpose

- ▶ Fluxes
 - ▶ Meteor brightness \rightarrow meteor mass
 - ▶ Fluxes to a limiting mass
- ▶ Spacecraft risk

Background

$$m_M = m_s - 2.5 \log(d)$$

- ▶ m_M - Meteor limiting magnitude
- ▶ m_s - Stellar limiting magnitude
- ▶ d - Distance meteor moves in a frame

Camera System

- ▶ Watec 902H Ultimate
- ▶ 17mm f/0.95 lens
- ▶ 31.7 km separation





20100317 01:19:41.747 UTC (48)

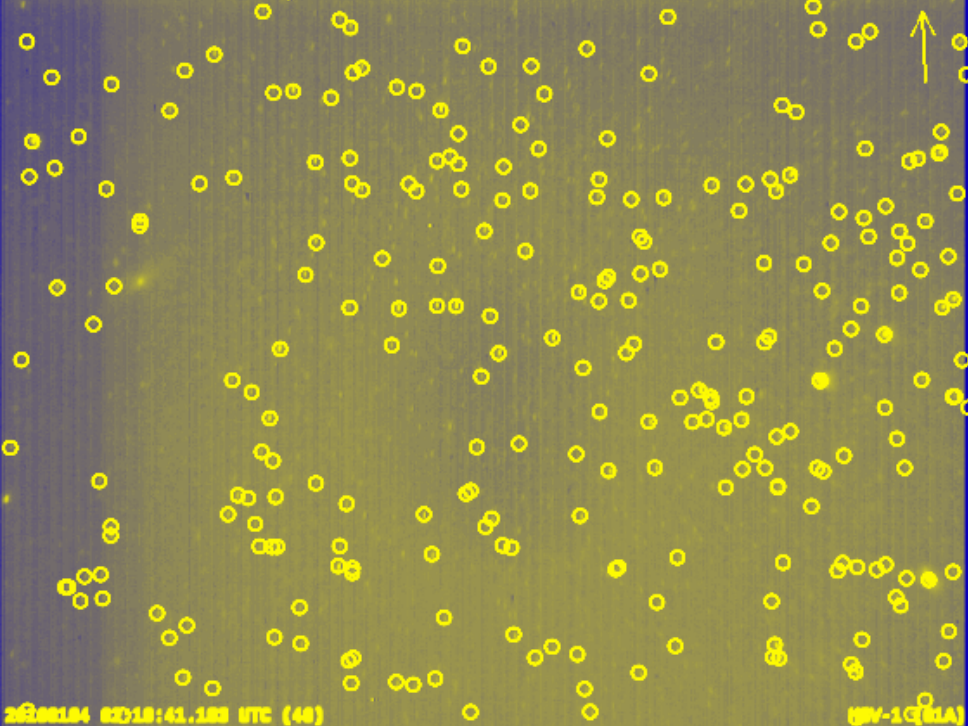
Decatur-4 (84A)

20150608 07:09:51.372609 UTC (3)

HSV-7 (07A)

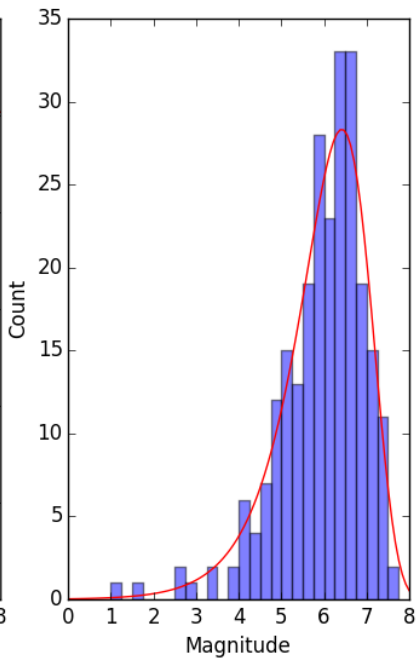
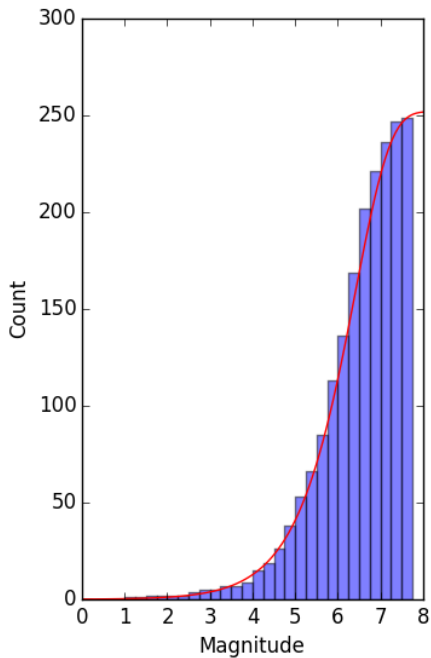
20150808 07:09:51.152183 UTC (3)

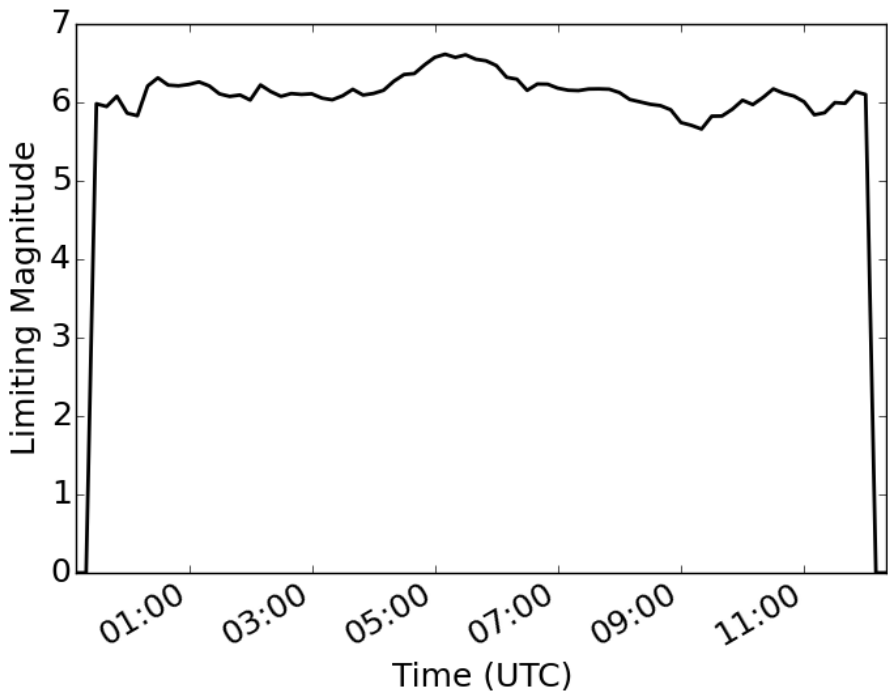
Decatur-8 (08A)



20200104 03:18:41.163 UTC (48)

HW-1 (S1A)





Background

$$m_M = m_s - 2.5 \log(d)$$

- ▶ m_M - Meteor limiting magnitude
- ▶ m_s - Stellar limiting magnitude
- ▶ d - Distance meteor moves in a frame

Meteor limiting magnitude

$$d = \left(\frac{180 r V_g \tau \sin \zeta}{\pi \text{FOV} \times R \times \text{FWHM}} \right)$$

- ▶ r - Camera resolution
- ▶ V_g - Geocentric velocity
- ▶ τ - Integration time
- ▶ ζ - Camera pointing to radiant angle

Meteor limiting magnitude

$$d = \left(\frac{180 r V_g \tau \sin \zeta}{\pi \text{FOV} \times R \times \text{FWHM}} \right)$$

- ▶ FOV - Camera field of view
- ▶ R - Range
- ▶ FWHM - Full width half max

