Radiative transfer in refractive atmoshere

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1. Background
2. Refractive effects
3. Scintillations

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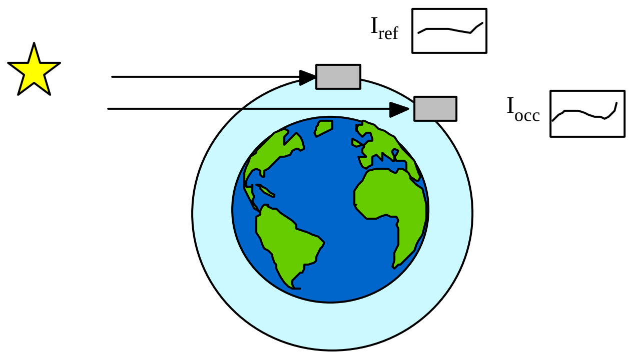
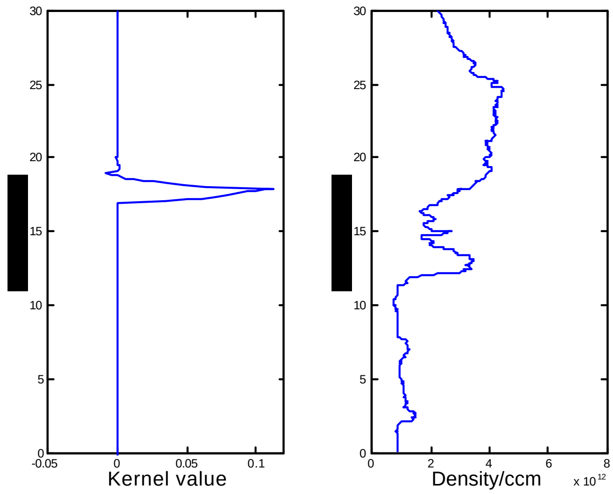
Global **O**zone **M**onitoring by **O**ccultations of **S**tars



$$T(\lambda) = \frac{I_{occ}(\lambda)}{I_{ref}(\lambda)}$$

Vertical resolution



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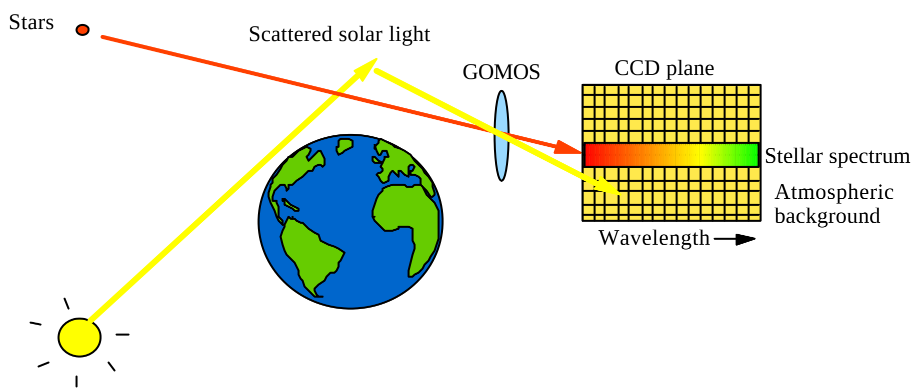
DAY AND NIGHT MEASUREMENTS



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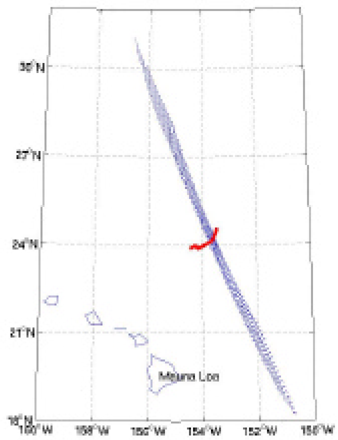
Geolocation: short occultation



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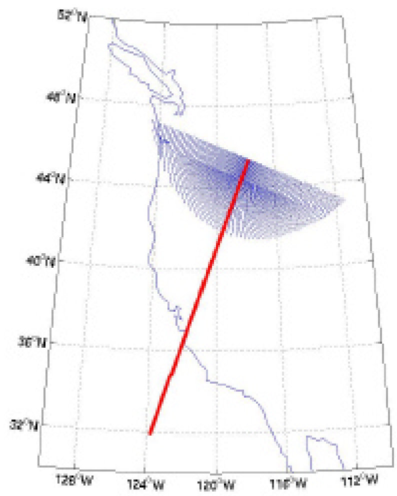
Geolocation: long occultation



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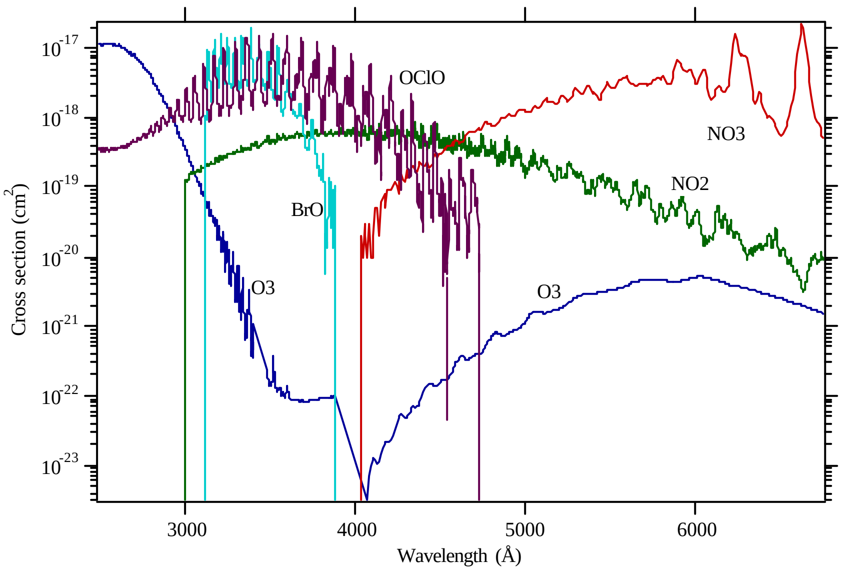

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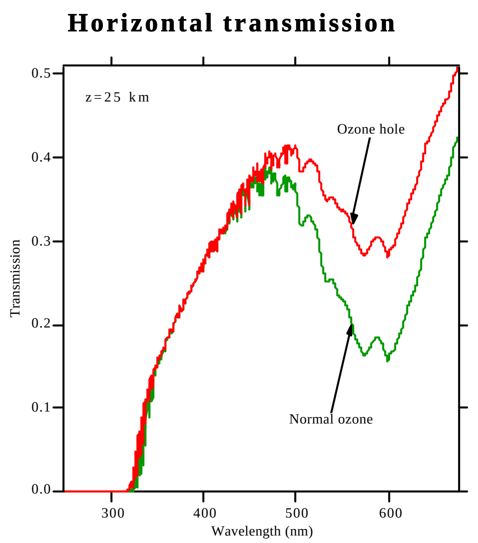

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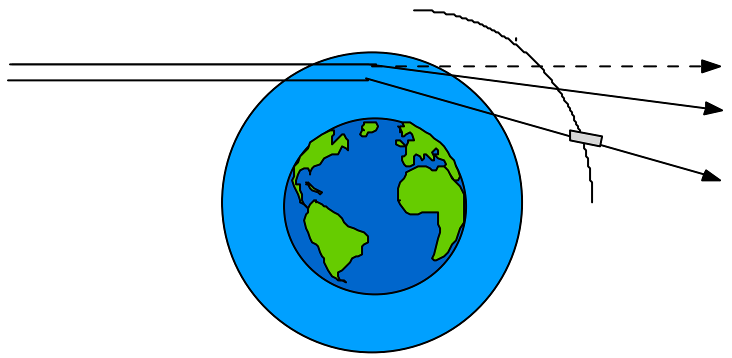
Measurement physics: refractive dilution



Increasing density gradient

→ differential refraction

→ intensity reduction

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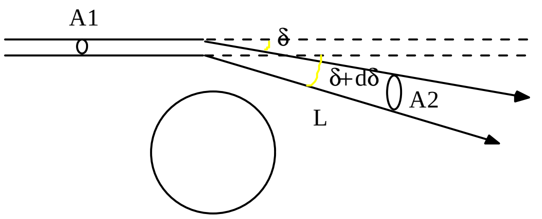
DILUTION TRANSMISSION

$$T_{dil}(\lambda,z)=\frac{A1}{A2}=\frac{1}{1+L\frac{d\delta}{dz}}$$

Here:

L= distance between the tangent point and the satellite
d= refraction angle
z=tangent height



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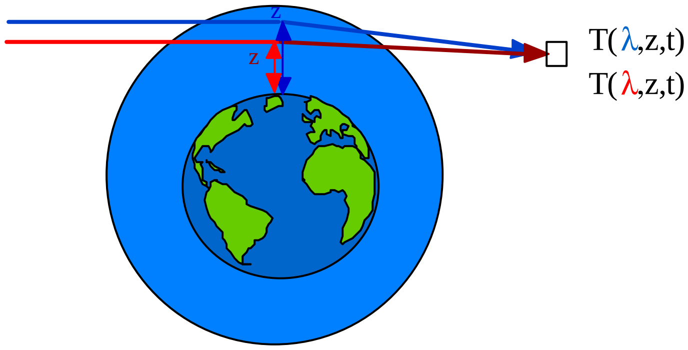
Measurement physics: chromatic refraction



Different colors-different tangent altitudes

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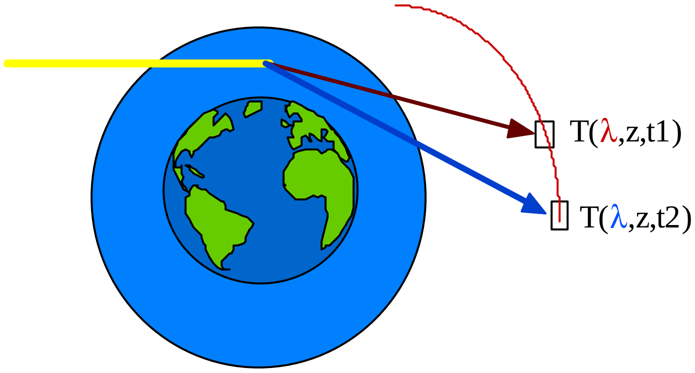
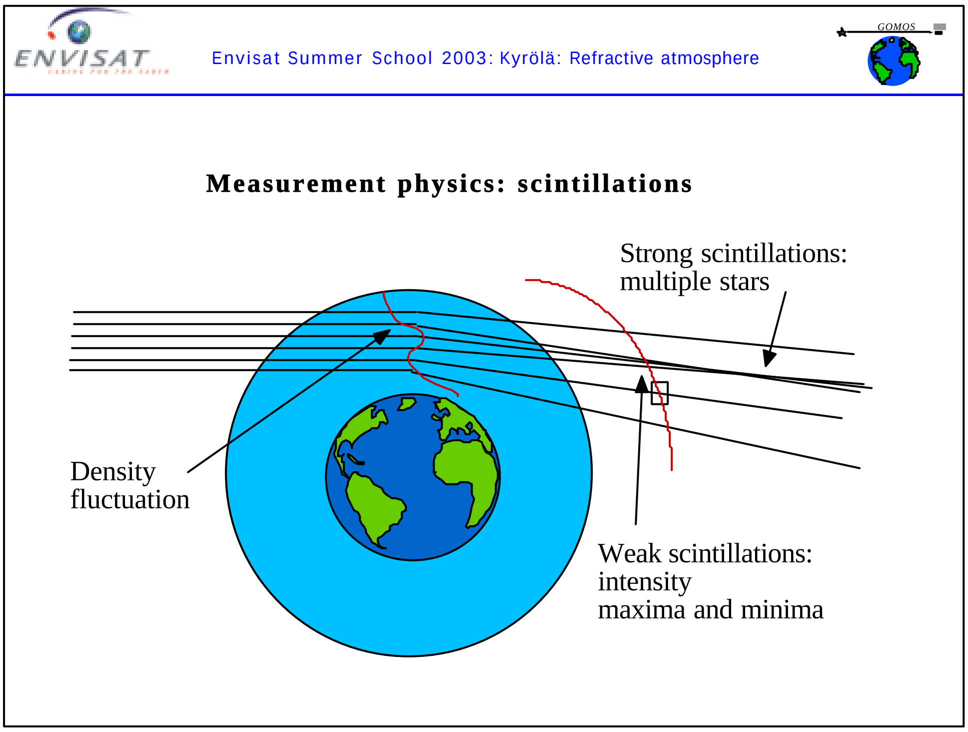
Measurement physics: chromatic time delay



Different colors-different refraction angles-different times


ENVISAT
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GOMOS
Measurement physics: scintillations
Strong scintillations:
multiple stars
Density
fluctuation
Weak scintillations:
intensity
maxima and minima

Stellar occultation instrument
UVISI
on MSX-spacecraft

UVISI by APL of Johns Hopkins University

Several hundred occultations since 1996

MSX movie
(not included
in this version)

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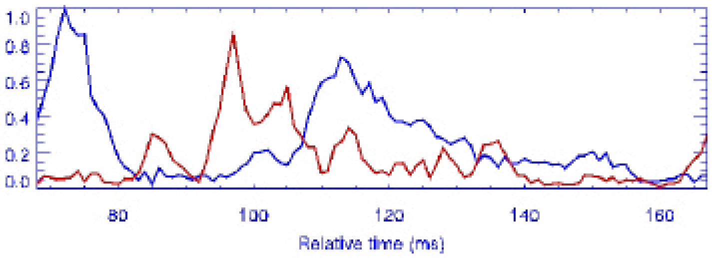
Photometer time series
(movies not included
in this version)



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Transmission movie (not included
in this version)