Atmospheric transparency in the optical and near IR range above the Shatdzhatmaz summit

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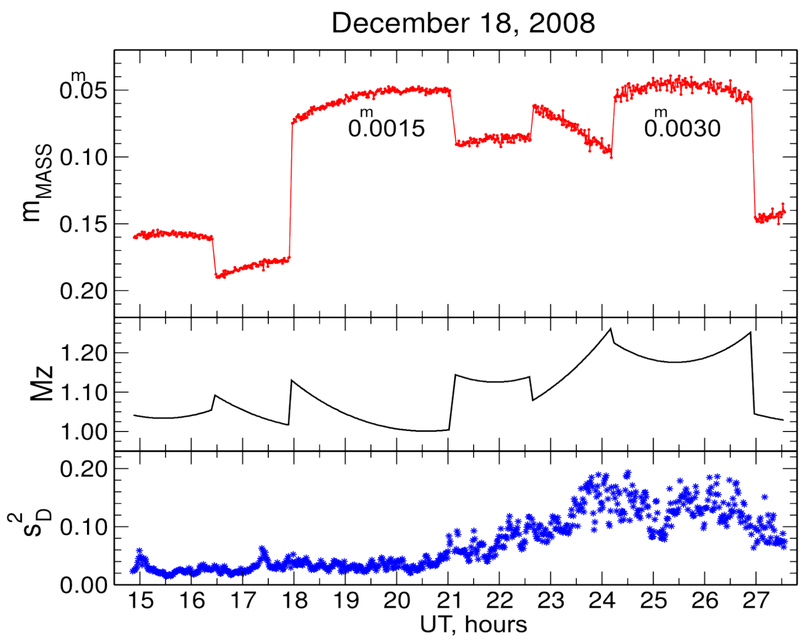
Atmospheric extinction in the MASS spectral band

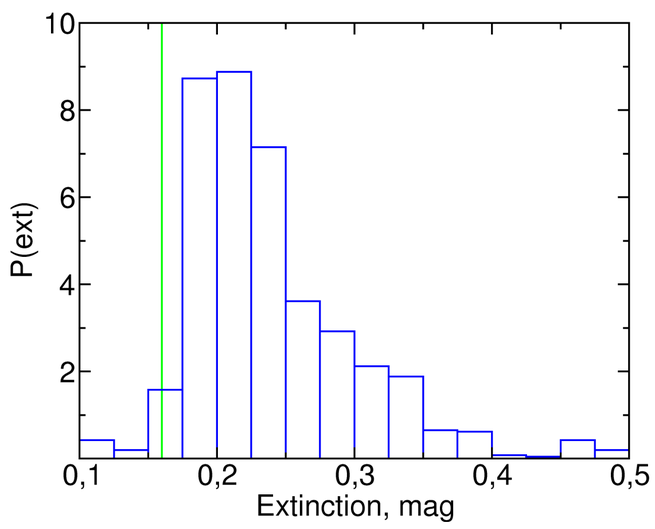


Example of a good photometric night. Red dots are instrumnetal magnitudes in D-channel of MASS. Blue dots — scintillation index

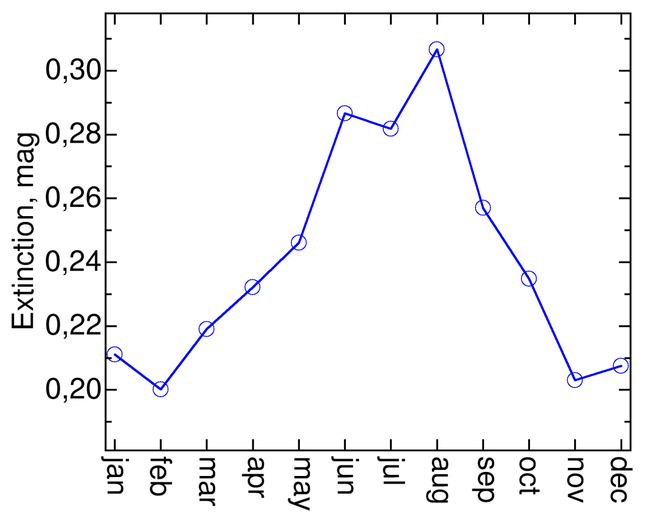
To study atmospheric extinction based on the MASS-data, we use the classical photometric pairs method. Observational program has been extended by a special photometric list of non variable stars with similar colors. The measurements of these stars at equal and different air masses allow us to determine their magnitudes in the MASS spectral band (λ_{eff} = 481 nm). Using these magnitudes, we study the night behavior of atmospheric extiction.

The list of photometric stars

Name	RA(2000)	DEC(2000)	mag(MASS)	Spectr
Bet_Ari	01 54 38	+20 48 29	2.72	A5V
Bet_Tri	02 09 33	+34 59 14	3.08	A5III
Eta_Tau	03 47 29	+24 06 18	2.84	B7IIIe
Bet_Tau	05 26 18	+28 36 27	1.60	B7III
Gam_Gem	06 37 43	+16 23 57	1.93	A0IV
Bet_UMa	11 01 51	+56 22 57	2.34	A1V
Del_Leo	11 14 07	+20 31 25	2.61	A4V
Bet_Leo	11 49 04	+14 34 19	2.18	A3V
Gam_UMa	11 53 50	+53 41 41	2.42	A0Ve
Eps_UMa	12 54 02	+55 57 35	1.75	A0pCr
Eta_UMa	13 47 32	+49 18 48	1.78	B3V
Zet_Dra	17 08 47	+65 42 53	3.12	B6III
Del_Her	17 15 02	+24 50 21	3.16	A3IV
Gam_Lyr	18 58 57	+32 41 22	3.22	B9III
Zet_Aql	19 05 25	+13 51 48	2.99	A0Vn
Alp_Cep	21 18 35	+62 35 08	2.56	A7V
Alp_Peg	23 04 46	+15 12 19	2.47	B9V



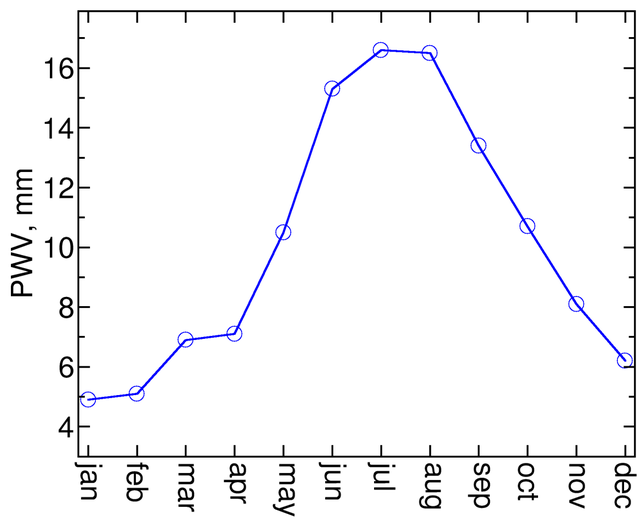
Distribution of atmospheric extinction in MASS
Median = 0.23 mag
1-st quartile = 0.20
3-d quartile = 0.27 mag
Vertical green line represents theoretical Rayleigh extinction for Shatdzhatmaz (0.16 mag).



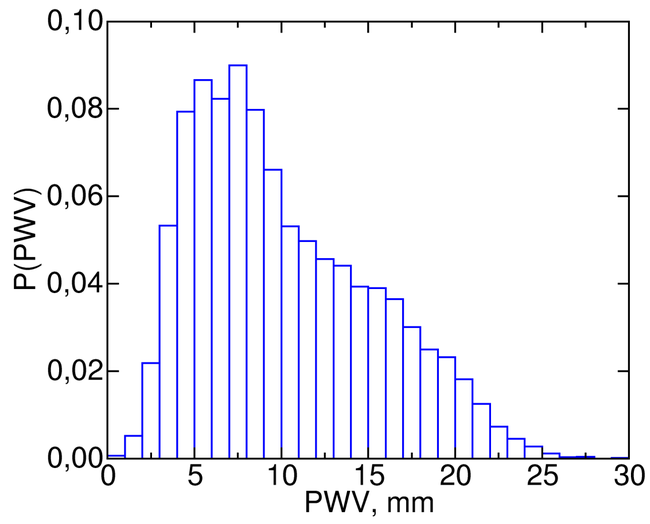
The seasonal behavior of median atmospheric extiction.
Minimum extinction is observed in winter, in the same period there are many clear nights.

Atmospheric transparency in near IR range

Transparency of the atmosphere in the near IR depends on the water vapor content. We estimate the amount of precipitable water using zenith wet delay of GPS-signal (Bevis, M. et al.,1994, Journal of Applied Meteorology, 33, 379). The GPS-data were obtained from a local GPS, installed by Sternberg Astronomical Institute in the frame of the geodynamics project. The meteo-data were kindly provided by the Kislovodsk station of the A.M.Obukhov Institute of Atmospheric Physics (Russian Academy of Sciences).

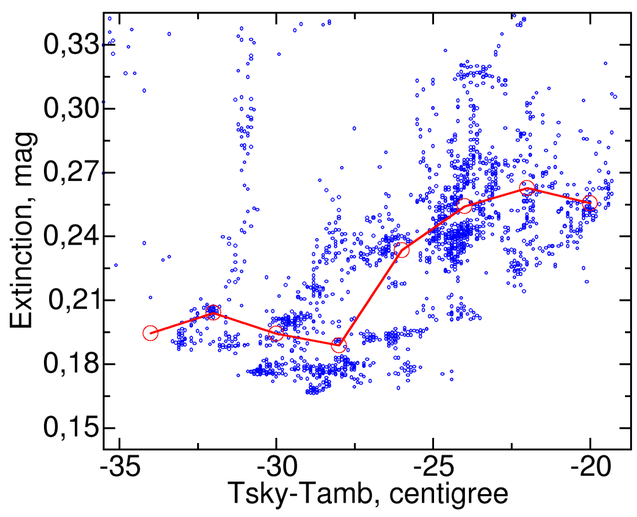


The seasonal behavior of precipitable water vapor.
PWV shows clear seasonal variation, mainly due to seasonal course of temperature.Winter and Spring are the best seasons for infrared observations.



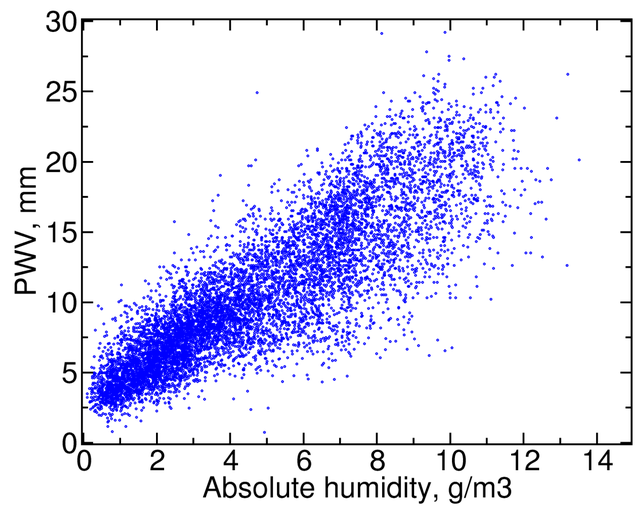
Distribution of precipitable water vapor.
Median = 9.1 mm
1-st quartile = 6.1 mm
3-d quartile = 13.9 mm

Some attempts to predict atmospheric conditions from ground-based meteorological data.



To monitor the clear skies, we use the Boltwood cloud sensor, located at the Solar Station.

Relationship between the sky temperature and atmospheric extinction in the MASS spectral band. Red line - median extinction in 2-centigree bins.



Absolute humidity versus column of precipitable water vapor. Humidity data are provided by the Kislovodsk station of the A.M.Obukhov Instutute of Atmospheric Physics.