Astronomical Observatory at Dome Fuji

Infrared Telescopes

40cm

Instruments (in progress)
- Near-infrared Direct Camera
  - 2KX2K VIRGO (J, H, K_{dark})
- 3 Color Infrared-Camera (K_{dark}, 3.4, L')
  - 2KX2K HgCdTe, 2-256x256 InSb
- Optical Camera (4KX4K)

2.5m (TBD)

Instruments (TBD)
- Wide Field Near-infrared Camera
  - 4KX4K InSb (J, H、K_{dark}、3.4、 L'、M')
- 3 Color Infrared-Camera and Spectrograph
  - 2KX2K HgCdTe, 2-2KX2K InSb
- 10 μ m Laser Heterodyne Spectrograph

Kurita mount

2008/01/19
T. Ichikawa

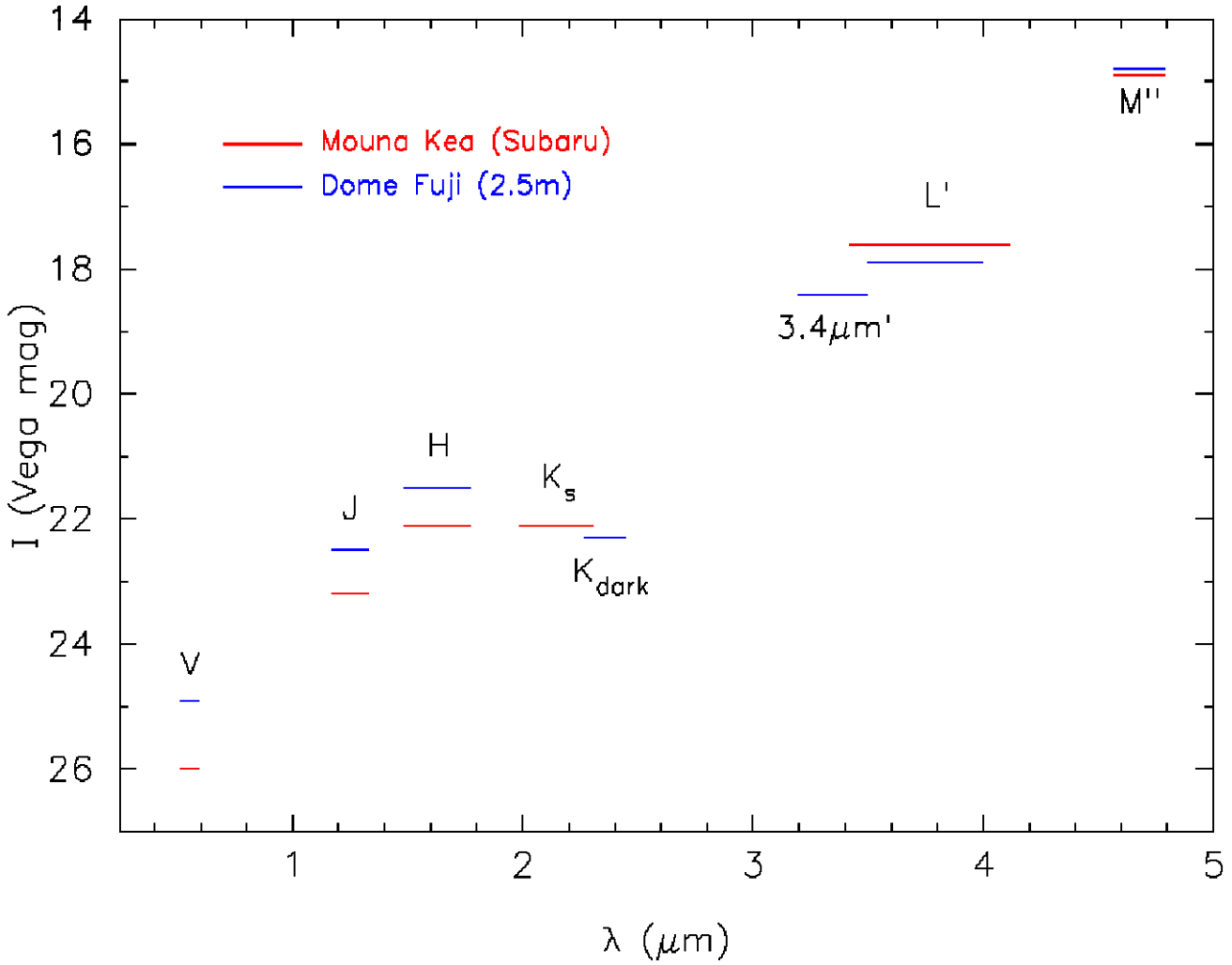
Limiting magnitude for point sources

S/N=5, 1h integration

band	λ_{eff} (μm)	40cm mag (μJy)	2.5m mag (μJy)	Subaru mag (μJy)
V	0.56	22.7 (3.0)	24.3 (0.70)	26.0 (0.15)
J	1.25	20.3 (12)	22.5 (1.6)	23.2 (0.84)
H	1.64	19.0 (25)	21.5 (2.5)	22.1 (1.4)
Ks	2.15			22.1 (0.93)
Kdark	2.36	19.2 (11)	22.3 (0.65)	
3.4μm	3.35	14.7 (400)	18.4 (13)	
L’	3.78	14.0 (630)	17.9 (17)	17.6 (23)
M’	4.78	11.0 (6600)	14.8 (200)	14.9 (180)

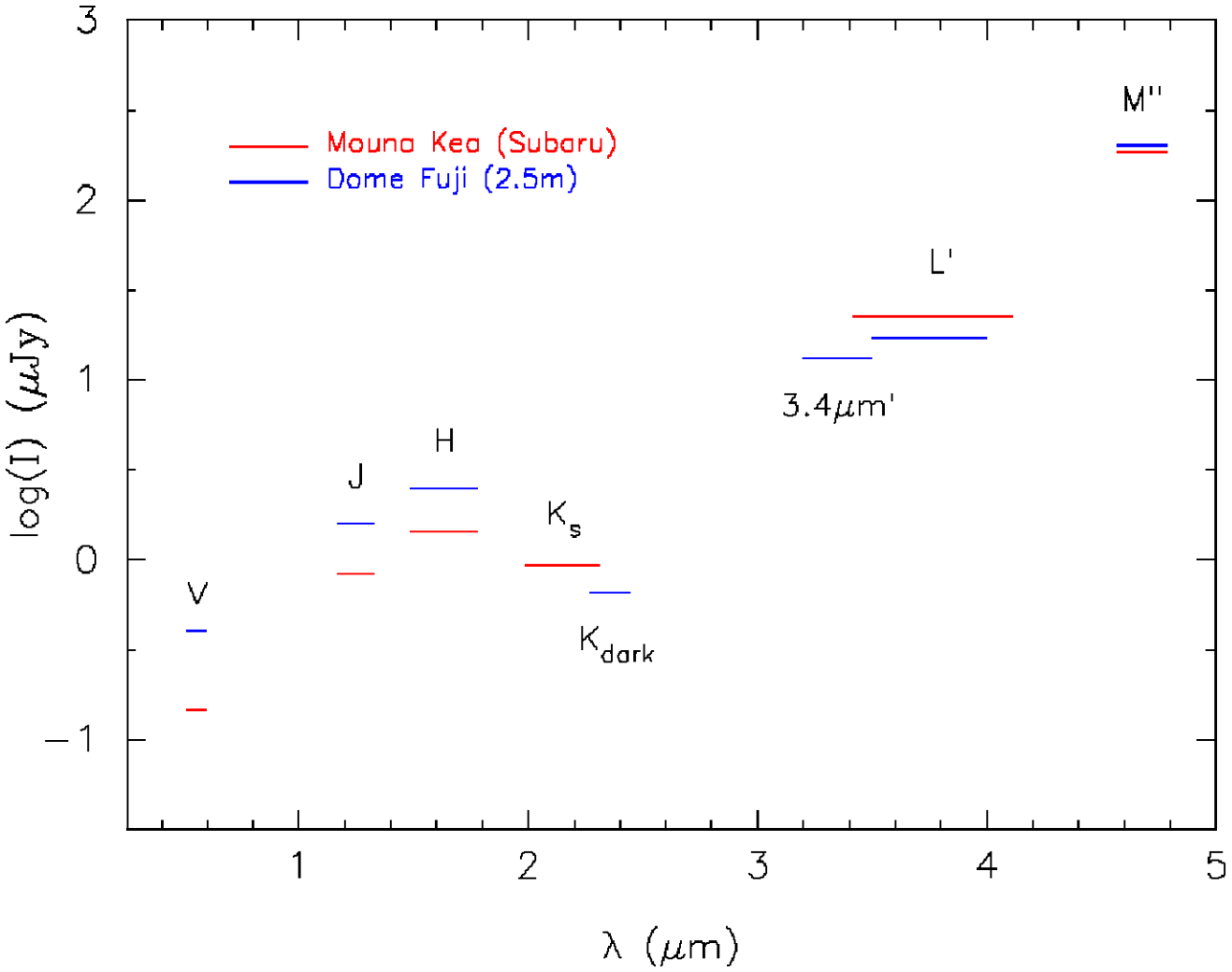
Comparison with Subaru for 2.5m Antarctic Telescope

magnitude in Vega

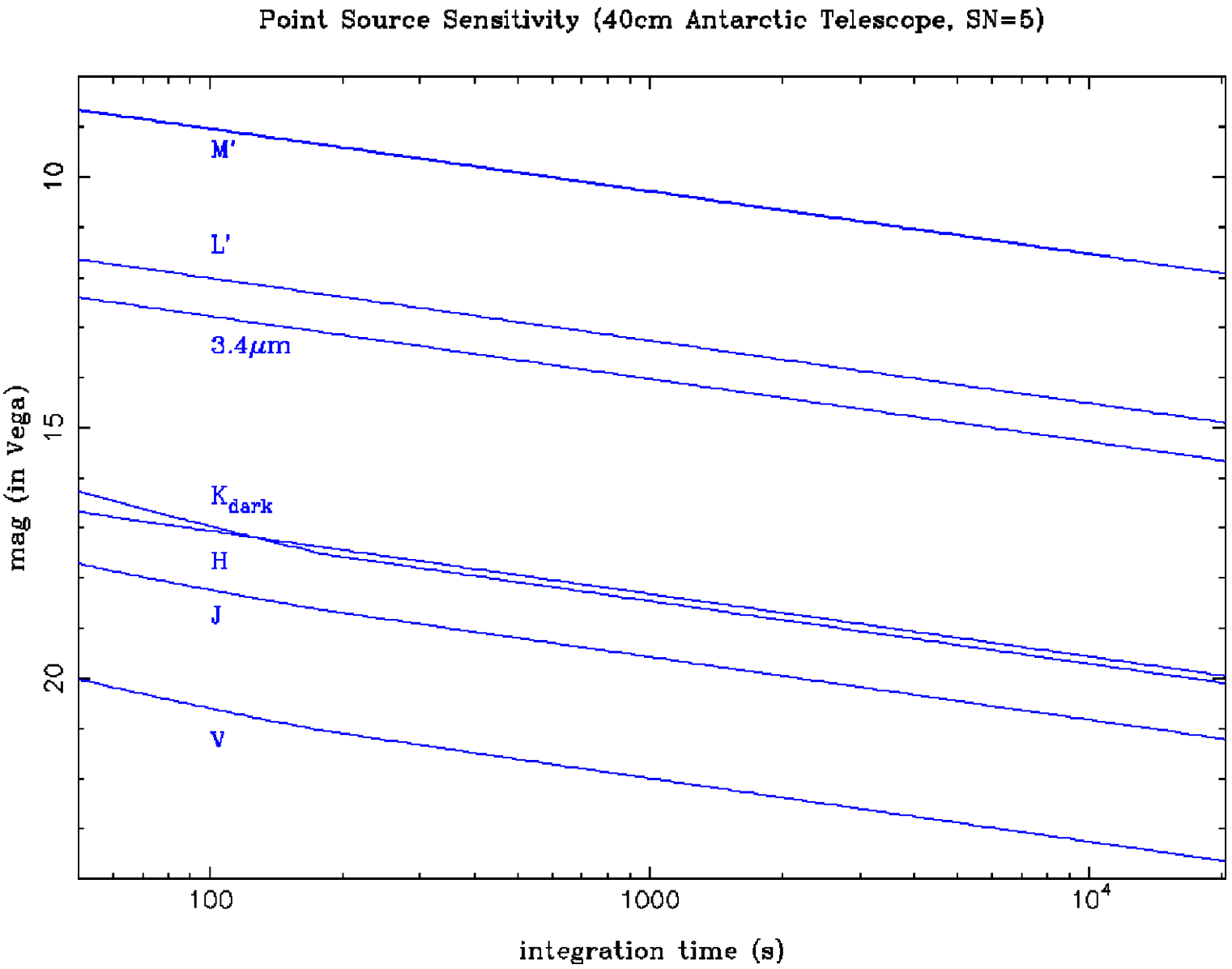


Comparison with Subaru for 2.5m Antarctic Telescope

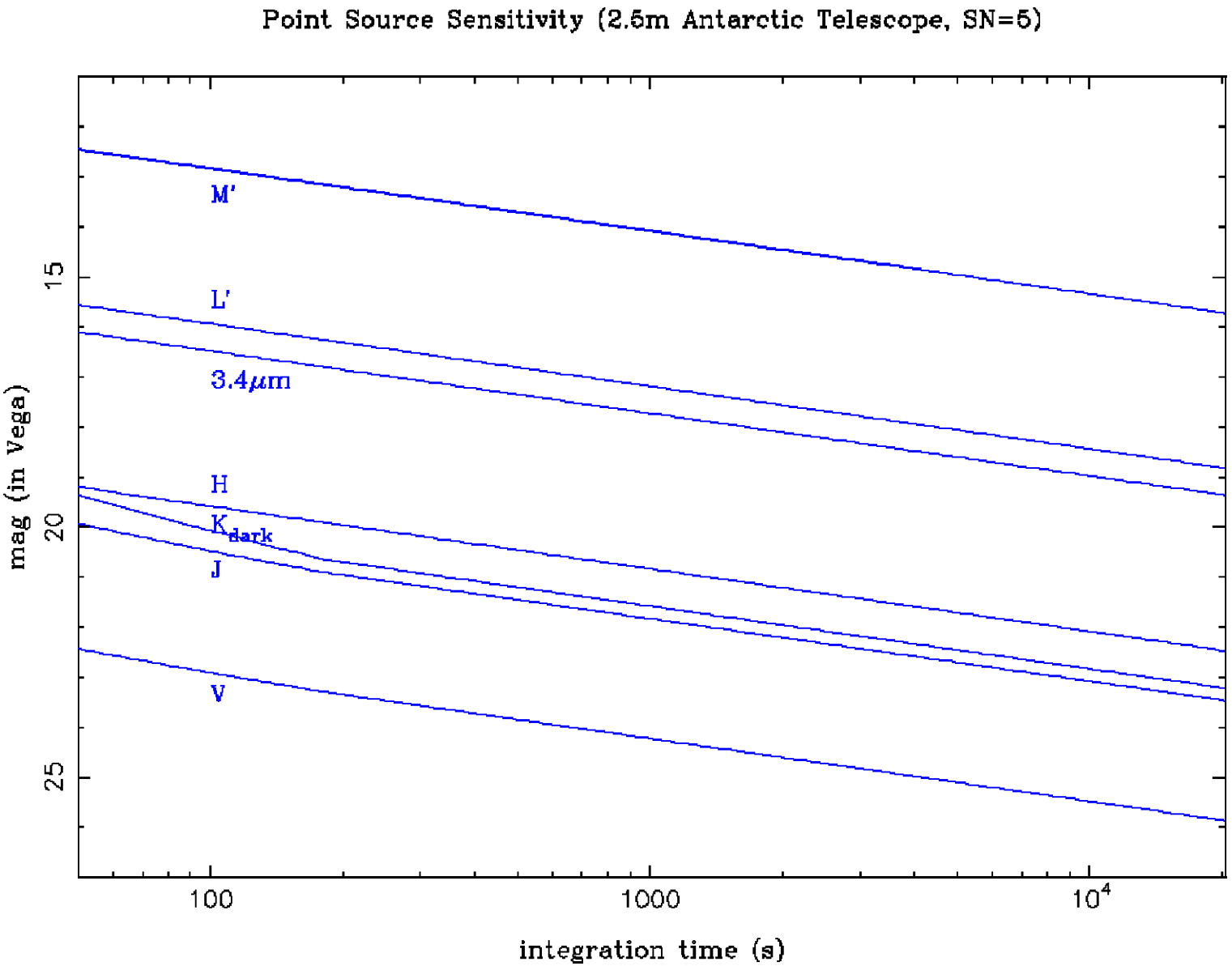
flux in μ Jy



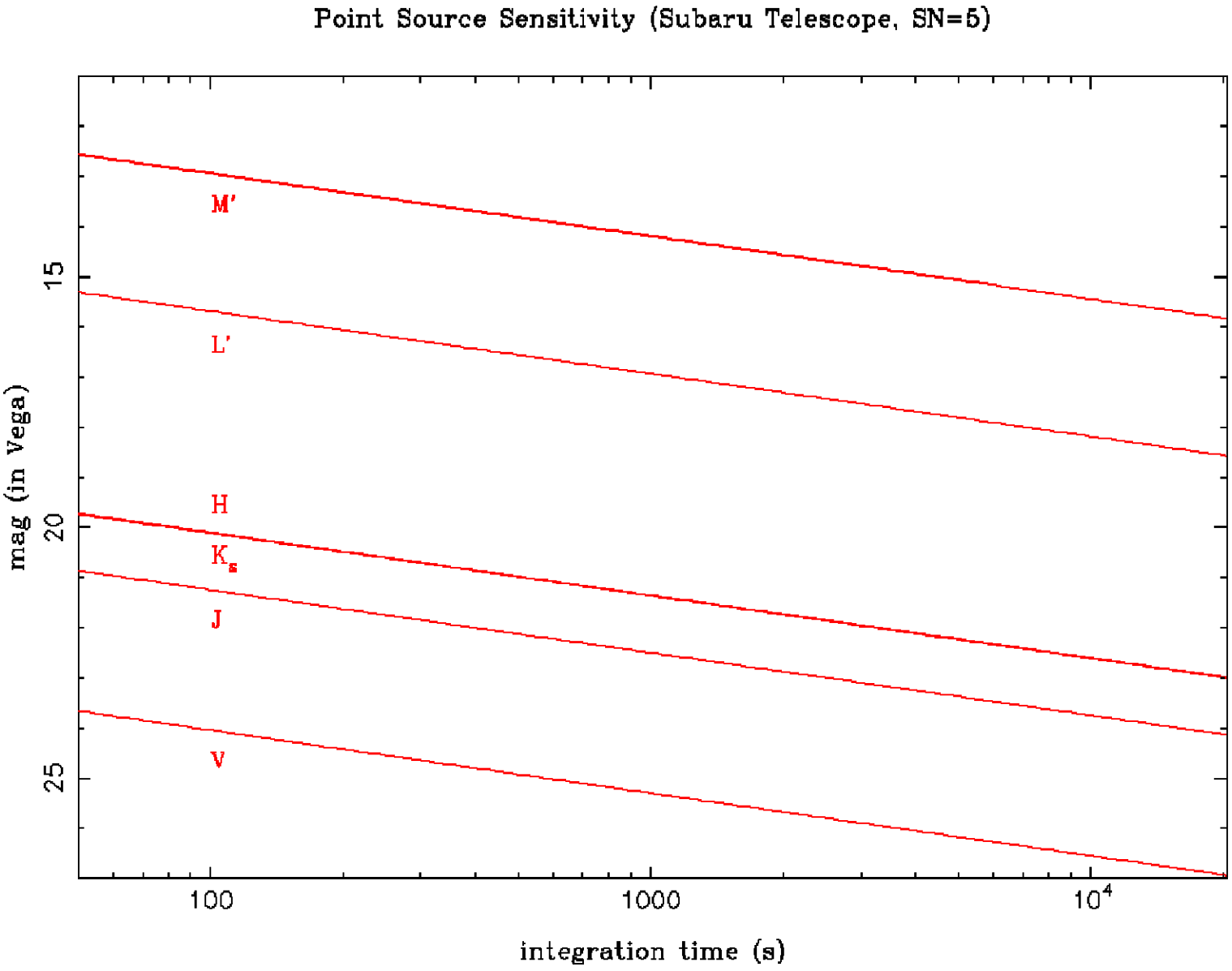
Limiting magnitude for 40cm Telescope at Dome Fuji



Limiting magnitude for 2.5m Telescope at Dome Fuji



Limiting magnitude of Subaru Telescope



Parameters used for the calculation

band	λ_{eff} (μm)	$\Delta\lambda$ (μm)	Vega		sky radiation at Dome F
			F ν (Jy)	Photons $X10^9$ $s^{-1}m^{-2}\mu m^{-1}$	mag $arcsec^{-2}$ (Vega)
V	0.56	0.083	3561	97.9	21.1
J	1.25	0.16	1593	19.8	17.9*
H	1.64	0.29	991	9.22	14.6*
Ks	2.15	0.32	640	4.53	14.5*
Kdark	2.36	0.18	543	4.93	17.9
3.4μm	3.35	0.3	303	1.48	9.41
L'	3.78	0.5	248	1.07	8.33
M'	4.78	0.22	157	0.66	3.93

* assumed 1/3 OH flux of Mouna Kea
Phillips et al. (1999) PASP, 527, 1009

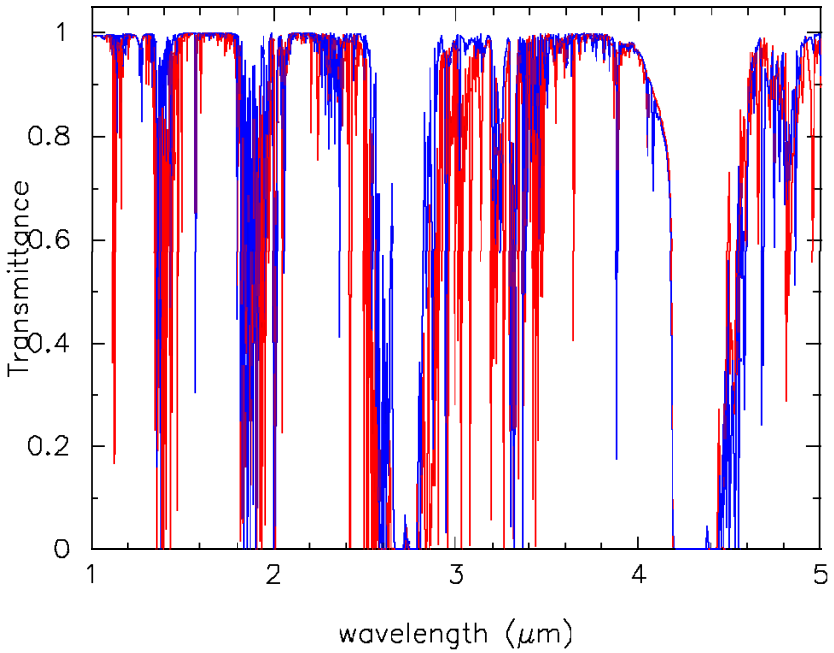
2007/12/20
T. Ichikawa

Transmittance in winter at Dome Fuji

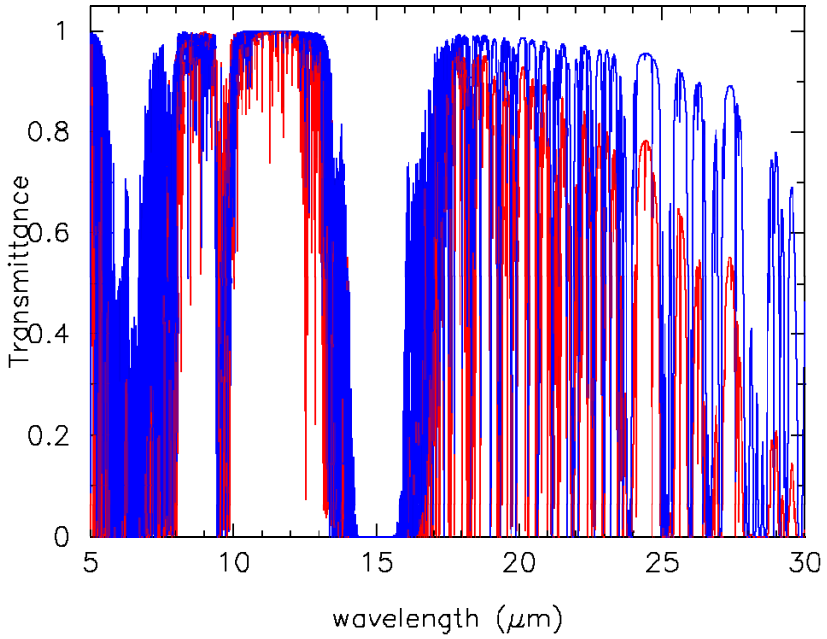
		altitude	temperature	PW
blue	Dome Fuji	3810m	-70℃	0.2mm
red	Mounakea	4200m	0℃	1.0mm

calculated with LBLRTM (Line-By-Line Radiative Transfer Model) (http://www.rtweb.aer.com/main.html)

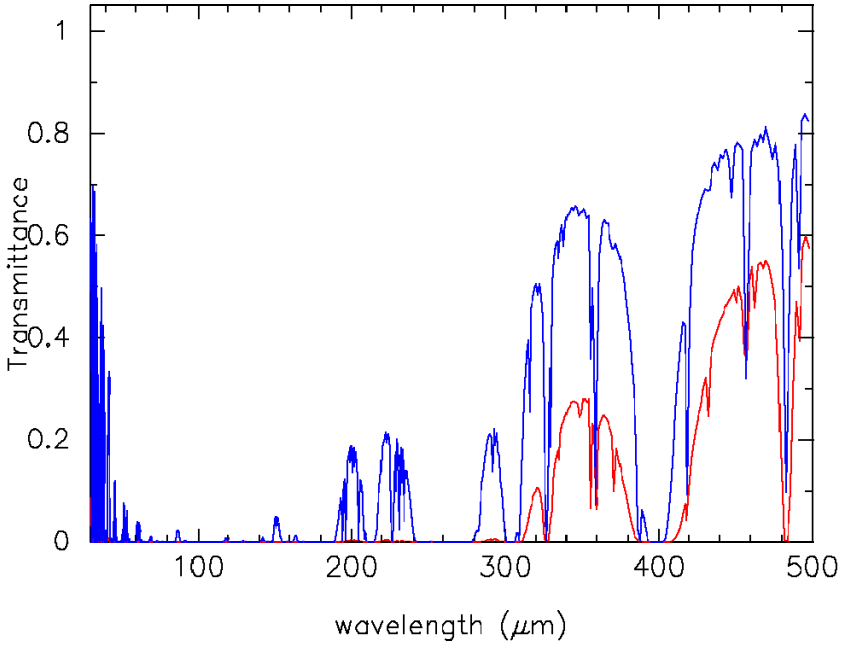
Near-Infrared



Mid-Infrared



Far-Infrared

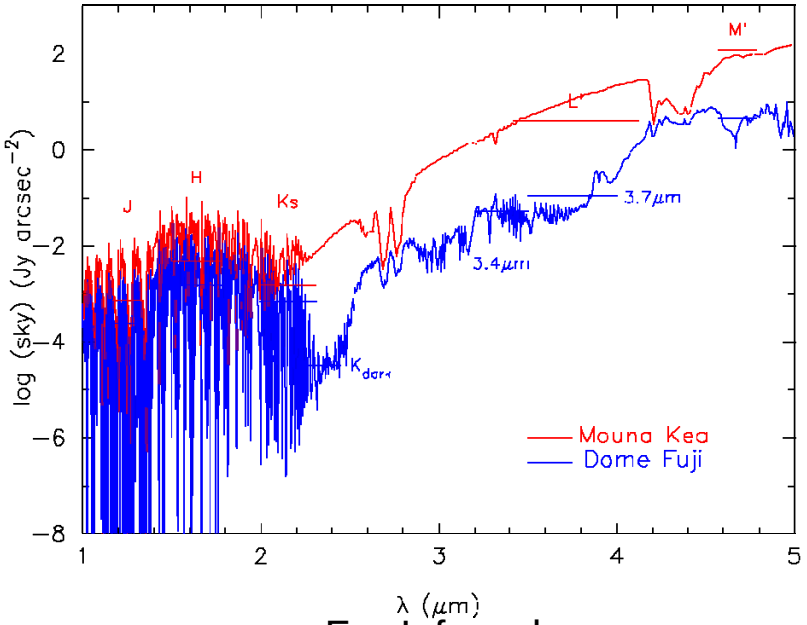


Sky radiation in winter at Dome Fuji

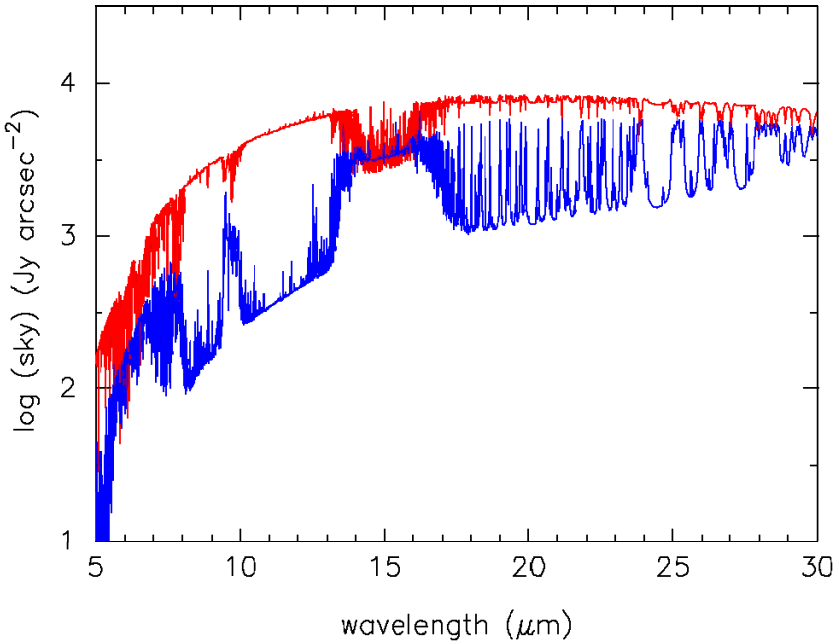
		altitude	temperature	PW
blue	Dome Fuji	3810m	-70℃	0.2mm
red	Mounakea	4200m	0℃	1.0mm

calculated with LBLRTM (Line-By-Line Radiative Transfer Model) (http://www.rtweb.aer.com/main.html)

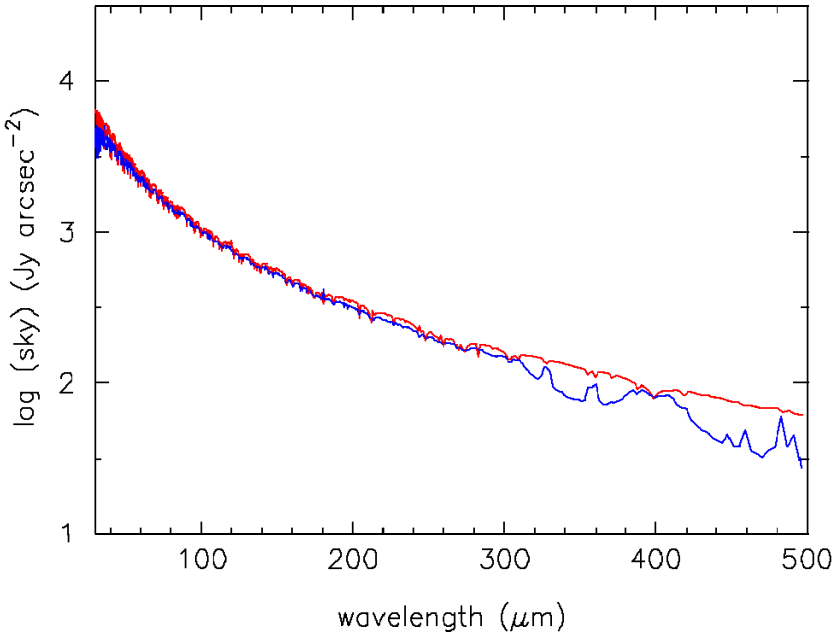
Near-Infrared



Mid-Infrared



Far-Infrared



参考: 使ったパラメータファイル

```
$ Dome Fuji
 HI=1 F4=1 CN=1 AE=0 EM=1 SC=0 FI=0 PL=0 TS=0 AM=1 MG=0 LA=0 OD=0 XS=0   00   00
 9000.000011000.0000       1.0      0.0       0.0       0.0    0.0000     0.000    0          0.0    1
p
0.02
  203.4000    0.300         0        0      0.7        0         0
    5    2    0    0    0        0 0  0                    0        0   -80.000
   100.000     3.810   180.000

-1.
$ Transfer to ASCII plotting data
 HI=0 F4=0 CN=0 AE=0 EM=0 SC=0 FI=0 PL=1 TS=0 AM=0 MG=0 LA=0 MS=0 XS=0    0    0
# Plot title not used
 9000.000011000.0000   10.2000  100.0000    5    0   12    0     1.000 0  0    0
    0.0000    1.2000    7.0200    0.2000    4    0    1    0    0    0 0    3 27
 9000.000011000.0000   10.2000  100.0000    5    0   12    0     1.000 0  0    0
    0.0000    1.2000    7.0200    0.2000    4    0    1    1    0    0 0    3 28
-1.
% US STD Atmosphere: Nadir viewing from 100 km down to the surface
```

使用するモデル(ほとんどデフォルト
9000cm^{-1}-11000cm^{-1}範囲(2000cm-1毎に分けて計算)
水蒸気量指定
水蒸気量(単位cm)
気温(K) 表面の放射率　　反射率
極圏冬モデル　　緯度
大気高度(upper)　測定高度(km)

ファイル出力を指定

9000cm^{-1}-11000cm^{-1}範囲
透過率をTAPE27に出力
放射量をTAPE28に出力

```
$ Maunakea
 HI=1 F4=1 CN=1 AE=0 EM=1 SC=0 FI=0 PL=0 TS=0 AM=1 MG=0 LA=0 OD=0 XS=0   00   00
 9000.000011000.0000       1.0      0.0       0.0       0.0    0.0000     0.000    0          0.0   1
p
0.10
  273.4000    0.800         0        0      0.2        0         0
    1    2    0    0    0        0 0  0                    0        0    20.000
   100.000     4.200   180.000

-1.
$ Transfer to ASCII plotting data
 HI=0 F4=0 CN=0 AE=0 EM=0 SC=0 FI=0 PL=1 TS=0 AM=0 MG=0 LA=0 MS=0 XS=0    0    0
# Plot title not used
 9000.000011000.0000   10.2000  100.0000    5    0   12    0     1.000 0  0    0
    0.0000    1.2000    7.0200    0.2000    4    0    1    0    0    0 0    3 27
 9000.000011000.0000   10.2000  100.0000    5    0   12    0     1.000 0  0    0
    0.0000    1.2000    7.0200    0.2000    4    0    1    1    0    0 0    3 28
-1.
% US STD Atmosphere: Nadir viewing from 100 km down to the surface
```