**Consideration of broadband seismic observation on Mars.**

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**[Introduction]**

The surface of Mars has been extensively investigated and huge amount of data have been acquired such as high Res images. On the other hand interior of the Mars has been only weakly constrained by the mean density, the moment of inertia and gravity data(fig1).

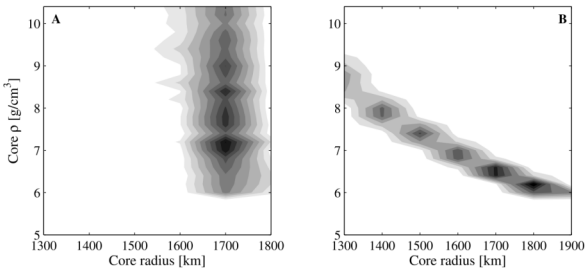


**Fig1:Calculated core size and density.**
**'Martian mantle composition and thermal states'**
**A.Kahn and J.A.D.Connolly et al 2008**

The size of core is poorly constrained and negatively correlated with the core density. High dissipation state is reported for the mantle by tidal interaction (Bills et al 2006), which is against a conventional view of small,cool planet. To clarify these points seismic observation on Mars is deadly needed.

**[Martian seismology]**

Japan Mars exploration project(MELOS) is now under discussion and it includes seismic measurements for determination the interior structure of Mars such as the core size, its state and attenuation in the mantle. Our plan is to install broadband high sensitivity seismometers(fig2),which are intended to detect continuous excitation of free oscillation by atmospheric turbulence(fig3). In this presentation we would like to show a basic design of broadband high sensitivity seismometer as well as environment protection designs. The basic parts are composed of a long period pendulum, laser interferometry and its control feedback electricity. As for the environment protection design,the following factors are important.

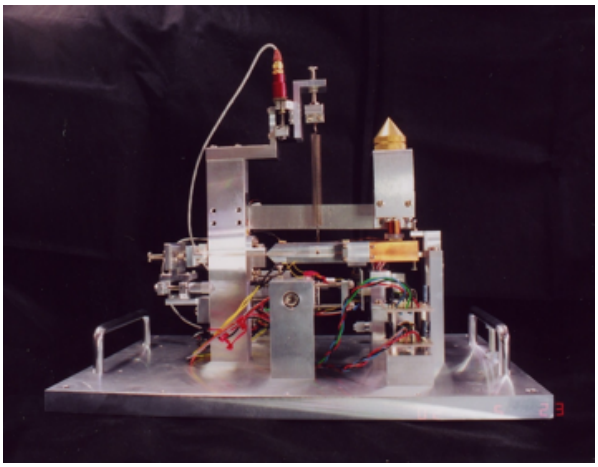

**Fig2:Servo-type seismometer**
**Akito Araya et al 2007**

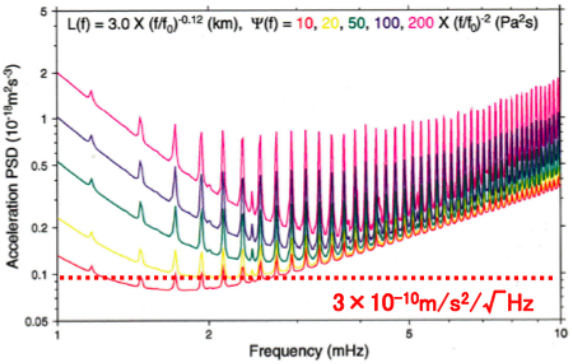


**Fig3:Mars' background free oscillation**
**Naoki Kobayashi et al 2008**

**[Environmental problems]**

1. Surface condition.
Martian surface is composed of stones gravels and sand. Drift is expected to occur due to the sudden change in ground slope. We need a device for self adjustment to keep the horizontal.

2. Temperature.
Surface temperature at Martian equator is expected to vary between 190 to 300K. We have to consider changes in spring tension, thermal expansion of components and changes in circuit constants.

3. Surface wind.
Inhomogeneously heated surface and topographic effect generate wind over 20m per second. We have to consider to lessen the effect of seismometer,even if we install the seismometer on the ground.

4. Radiation.
Radiation that rains down on Mars is stronger because of thin atmosphere. Radiation causes damage in effects electrical circuit, causes material degradation and improper operating signals.

**[Wind tunnel test]**
We have to make provision. Surface wind seems to be the most important and specific problem. We are conducting wind tunnel experiments for efficient design of wind shelter over the seismometer. We will issue a report on the test.

**References:**

[1] A.Khan and J.A.D.Connolly, Constraining the composition and thermal state of Mars from inversion of geophysical data, Journal of Geophysical Research,Vol. 133 E07003,2008

[2] C.F.Yoder et al., Fluid Core Size of Mars from Detection of the Solar Tide, Science ,Vol.300 299,2003