

## Venus: *In situ* mini mission.

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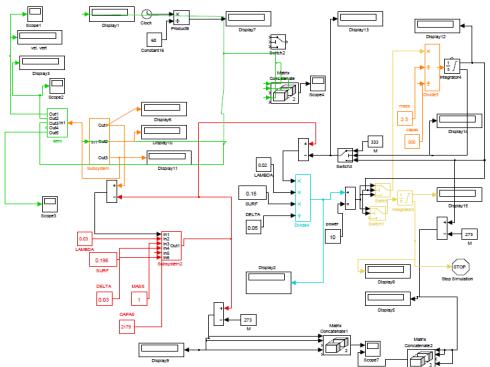
### Abstract

A low cost, low mass (20-30 kg) for Venus lower atmosphere *in situ* investigation is proposed. *In situ* Venus investigation is necessary because Venus atmosphere is opaque in optical range and remote sensing from the orbit is impossible. The most part of the atmosphere's mass, its boundary layer above the surface and the surface itself are closed by the dense cloud layers. The sounders with the instrumentation should penetrate deep into the atmosphere. There are two alternatives for the sounder philosophy corresponding to two scientific goals:  
 1. the **Venus atmospheric probe (VAP)** for investigations of atmospheric parameters or 2. the **Venus Lander (VL)** for a study of properties near the surface. Because of a heating protection and the thermal insulation problems their design concepts are quite different (table 1):

Table 1

	Venus atmospheric probe (VAP)	Venus Lander (VL)
Duration of the descent time, 55-0 km	50 min / 70 min	30 min / 40 min
Active time on the surface	15 min (not guaranteed) / 0	60 min / 50 min
Science	Atmospheric . optional: imaging	Atmospheric , Seismic. Optional: imaging, chemistry
Stabilization	parachute	tail-plane
Ballistic coefficient $M / Cd * A$	minimum	maximum
Terminal speed at surface	<10 m/s	>15 m/s
Thermal control	Two stage passive, Melting PCM	Two stage passive, Melting PCM

Numerical SIMULINK model for dynamics and thermodynamics for Venus descender was created.



A lot of calculations for a descent for the most suitable shapes of the sounder have been made including the stabilization and thermal design.

Possible scientific instrumentation for both versions is discussed.

## References

REFERENCES

- [1] **Ekonomov, A.**, Korablev, O., Zasova, L.: Technology development for long-lived Venus landers . EPSC abstracts vol. 2,2007 , [EPSC2007-A-00387](#).
- [2] **Ekonomov, A.**: How and why to survive at Venus surface. EPSC abstracts vol. 3,2008, [EPSC2008-A-00207](#).
- [3] **Ekonomov, A.**, Gotlib, V., and Lipatov, A. Microprobe experiment in frame of future Russian mission Venera-D. EPSC abstracts volume 4,2009 [EPSC2009-276](#).