Interactive comment on "Martian dust devils detector over FPGA" *by* E. de Lucas et al.

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General comments: The article is well written and introduces an innovative approach to space instrumentation where the limitation of resources is usually conflicting with the complicity of the scientific goals to be accomplished. Using the strategy of adaptive implementation of different firmware modules in a reprogrammable Field Programmable Gate Array for space applications could revolutionize the way electronics is implemented in future space projects. But the same technology could also be applied to a wide range of Earth-bound applications. A complication for space applications at least in the near future could be the radiation sensitiveness of the reprogramming features in the used components which seem to have the tendency to fail at a much lower total radiation dose than the performance specification of the programmed operational circuits otherwise indicates. For details see for example the radiation qualification reports from Microsemi/Actel, published in April 2011. Until this problem is overcome,

the strategy of changing functionality by partly re-programming the circuit according to operational needs may limit the application to planetary surface programs. This is in line with the application for Mars surface science proposed in this article. Specific comments: In the introduction section the authors should at least mention the additional complexity for component firmware verification related to the quality assurance requirements for space instrumentation. The needed additional amount of resources in manpower and integration time might in the worst case outbalance the advantage of the faster initial development process. Also the instrumental overhead for reliably store the downloadable code of the firmware modules to be exchanged should be evaluated, as the reliability requirements for the related storage medium will be higher than for standard processor-based software. This is especially the case if the functionality of the circuit's interface section could be affected: a wrong programming could destroy the attached hardware permanently. It would be informative to include an estimate for the typical time needed to perform a partial reprogramming. Reports of large dust devils on Earth and Mars are mentioned but no reference is given. Please supply references. Section 2: The authors should mention the instrument on Mars Pathfinder from which the data were used and the time interval of the used data. Please replace the quote "NASA" with "NASA Planetary Data System" and update the quoted link to the correct one, which is most likely : http://pds-atmospheres.nmsu.edu/cgi-bin/getdir.pl?dir=index&volume=mpam_0001 In the description of the used data, data sampling intervals between 4 s and more than 1 h was quoted. This should directly be correlated here to the expected time scale for the investigated phenomena. Typical dust devils as observed with NASA's Phoenix Lander in the polar region of Mars resulted in pressure drops of about 2 to 5 seconds after which the average pressure level was reached again. This time scale could also be corroborated by camera observations of the passing dust phenomena. Data sets with resolution in the same time frame or worse might not give enough unambiguous information to verify the performance of the developed algorithm. Section 2.3: The used algorithm strategy should be explained in more detail. The rational for using the configuration values as listed in table 1 should

be explained. Are they auto-adapted via the LTA calculations or statically based on tests with the observational data? While the usage of integer arithmetic is certainly justified for such a hardware implementation, the authors should evaluate the effect of the introduced errors. The effects to be detected in the data represent only a small fraction of the dynamic range of the data sets, so that rounding effects caused by integer operations could have the same order of magnitude as the data variation caused by a passing dust devil. What is the data word length used in the data processing chain, especially for the summed squared values?

For technical corrections please see the attached PDF-file

Please also note the supplement to this comment:
http://www.geosci-instrum-method-data-syst-discuss.net/1/C24/2012/gid-1-C24-2012-supplement.pdf

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 1, 1, 2011.