< please add institutional letter head>

Prof. Alvaro Gimenez, Director < please add date>

European Space Agency HQ

8-10 rue Mario Nikis

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Dear < please send a copy to Director Gimenez and a copy to your SPC Delegate> ,

I have been informed that the ESA executive will not propose the Cluster mission for extension in 2019-2020 to the Science Programme Committee (SPC). I am writing to call for continuation of Cluster operations, while Cluster remains scientifically effective.

Cluster has been acquiring a unique scientific data set for over a solar cycle and continues to produce uniquely valuable observations. The extension proposed in 2019-2020 would address new science as follows:

1. determination of the sources and causes of “chorus” plasma waves using Cluster’s unique capability to make multi-point measurements at relevant scales (here, 3 km), at both low and high latitudes, alongside complementary observations by Van Allen Probes and Arase (chorus waves are thought to generate radiation belt electrons).
2. the first investigation to utilise *local* solar wind measurements (provided by one Cluster spacecraft) to overcome critical timing uncertainties in investigations of short-lived bow shock, magnetosheath and magnetopause physical processes (observed by the other Cluster spacecraft and by the Magnetospheric Multiscale (MMS) mission), and their impact in the magnetosphere (observed by the THEMIS multi-point mission).
3. the first targeted studies of the evolution of Kelvin–Helmholtz waves on the magnetosphere’s flanks with simultaneous wave observations along the flank by Cluster and MMS, and in the magnetotail by THEMIS, to test whether the waves enable solar wind plasma entry to the magnetosphere, as well as energy and momentum.

Cluster’s unique polar orbit, multi-scale constellation, and instrument suite make it extremely complementary to missions such as NASA’s *MMS*, THEMIS & Van Allen Probes, and JAXA’s ARASE & Geotail, and ground based observatories (e.g. Super- DARN, EISCAT, EISCAT-3D in future) with which joint campaigns are carried out.

Only Cluster can visit the magnetospheric cusps (now coming back within reach after being inaccessible for years, due to orbit evolution). Cluster *in situ* cusp data is needed for preparations for the SMILE mission’s pioneering remote sensing cusp observations.

Cluster’s orbit also enables it to make important measurements in the “MEO” regions used by operational (e.g. GPS) spacecraft. Such data are sought as part of an effort to improve space environment models, for example for space weather prediction purposes.

In conclusion, we wish to reiterate that we advocate and endorse continued Cluster operations for as long as new quality science observations can be obtained.

Sincerely yours,

<please add signature and role here>