



Ionosphere ground based monitoring network in low latitude regions: Southeast Asia & Pacific

Ground-based Ionosphere monitoring Network in SoutheastErn Asia: a survey (GINESTRA)

Executive Summary

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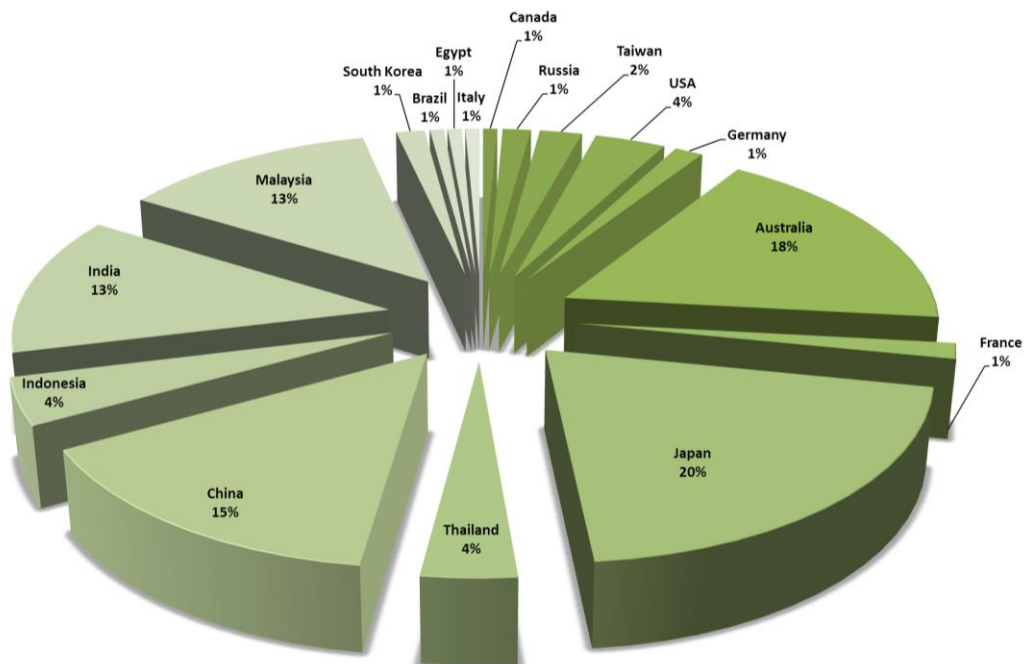
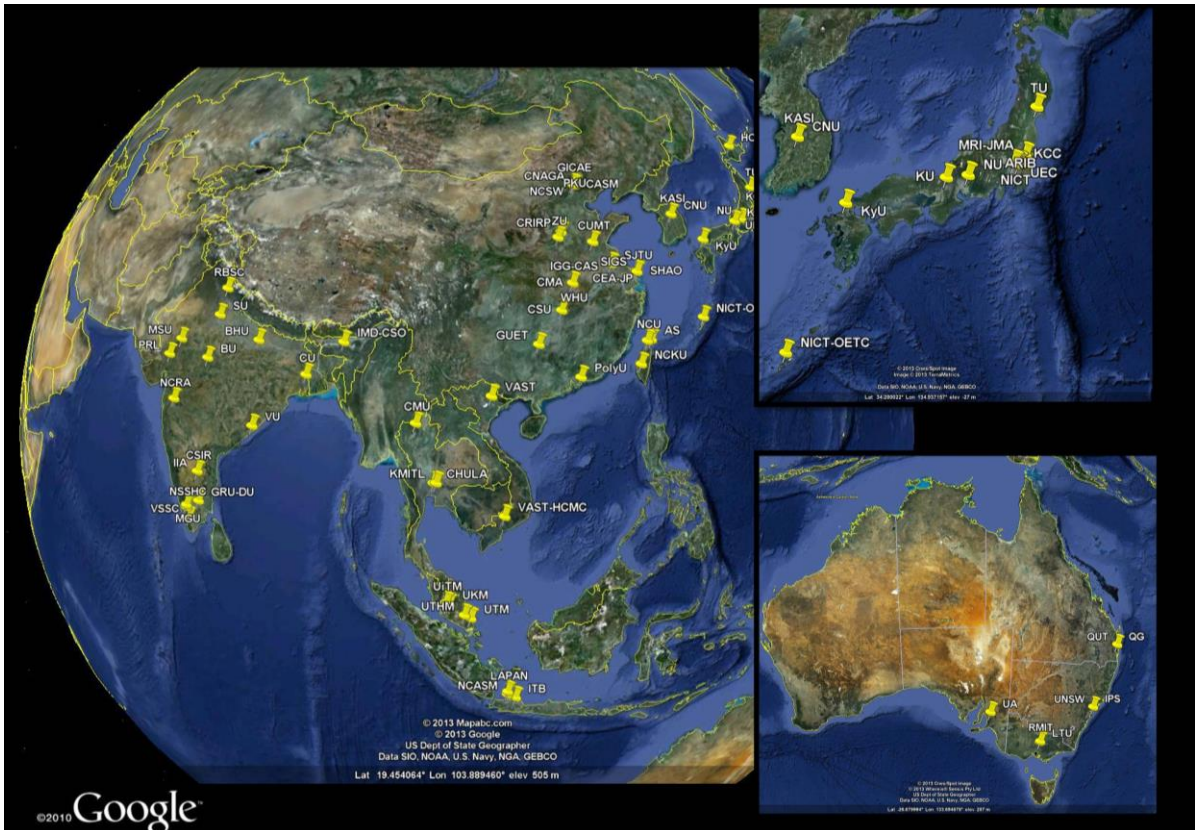
ESA study manager Raul Orus Perez

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Study Type: Survey

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Picture:



Distribution of the institutions in South East Asia & Pacific identified in the literature review (top). Percentage of the first authorship evaluated on the total number of the surveyed papers (bottom).

Motivation:

Scope of the survey was to explore current capabilities of ionosphere monitoring in South East Asia (SEA) and Pacific regions in order to identify institutions involved in this field and existing monitoring facilities which could be integrated with new ionosphere monitoring installations.

Methodology:

The GINESTRA team conducted the survey with a mixed approach of direct contacts and literature review. The work was organized in consecutive steps:

1. Literature review: scientific papers published in the last 10 years were analysed to identify existing facilities, institutions involved in ionospheric studies and scientists active in this field.
2. Workshop: the GINESTRA team organised a workshop in Hanoi which was announced to scientists of the region. The workshop gathered researchers from Vietnam, Malaysia, Thailand, and China. A final round table was very useful to understand problems and issues coming from local researchers.
3. A questionnaire was prepared and published on-line. Collected answers were analysed.
4. Direct contacts through e-mail messages allowed the GINESTRA team to better detail some of the collected pieces of information.

These actions resulted in the identification of existing facilities, available equipment, local experts in the field, peculiarities of the ionosphere in the region as well as geographical sectors not fully covered.

Results:

The most significant results of the GINESTRA Competence Survey are:

- A better understanding of scientific research carried out in the region in the field of ionosphere analysis and monitoring. Both the Indian and Chinese ionospheric regions are described as highly variable in latitude and longitude. Also the SEA countries report peculiarities of the local ionosphere. In the analysed papers, it is often suggested the use of different kind of instruments located in the same site to improve the current knowledge of both the interactions between different ionospheric regions and the coupling between ionosphere and neutral atmosphere. For what concerns the connection between seismic and ionospheric effects, there is the need to clarify the pre-seismic GPS derived ionospheric anomaly, in terms of experimental verification and of theoretical assessment.
- As for the deployed equipment, GNSS receivers represent the highest share, even though only a minority are equipped to sample the ionosphere at 50 Hz and to directly provide scintillation parameters. There is a lack of other kind of equipment such as magnetometers and ionosondes. Concerning data networks, in South East Asian countries data are often available only at national level and restrictions exists on the possibility of sharing data (in

particular in real-time) with external users. Institutions involved in scientific and research activities belonging to different SEA countries hardly share knowledge, information, data.

- In most of South East Asian countries there is a strong interest in international scientific cooperation. Actions coming from European institutions are considered a good chance to trigger attention on these topics from their national authorities and governments and to enlarge their cooperation with international and regional scientists.
- A dossier with interactive maps of existing facilities, deployed instruments and local experts together with a spreadsheet of the scientific papers published in the last 10 years on ionospheric studies in the region of interest was prepared.

Publications:

The team is preparing a paper to be submitted to a peer-reviewed journal. In addition, the following contributions can be mentioned:

Povero, G., Pini, M., Alfonsi, L., Spogli, L., De Franceschi, G., Notarpietro, R., Doviš, F., Ta Hai, T., “*GINESTRA – Ground-based Ionosphere Monitoring Networks in Southeastern Asia: a survey*”, Workshop on GNSS Data Application to Low Latitude Ionospheric Research ICTP Trieste, May 10th, 2013.

Alfonsi, L., Povero, G., Rose, J., “*GINESTRA, MImOSA and MEDSTEC: Competence Surveys within the ESA ALCANTARA Initiatives*”, European Space Weather Week, 18-22nd November 2013, Antwerp, Belgium.

Highlights:

Having a clear picture of the status of ionosphere monitoring and related studies in the region, a research plan has been prepared. On top of the proposed scientific activities, the plan has been designed to answer some of the needs which local experts highlighted as the most relevant and urgent, such as the availability of equipment, data sharing, educational/training actions, and awareness initiatives to point out the importance of studies to better understand the ionospheric features in the South East Asian region, which is characterized by an anomalous distribution of the electron density.