Memorandum of Understanding

Between

National Space Science Center, Chinese Academy of Sciences

And

Chiang Mai University

About the International Meridian Circle Program and Joint Space Weather Research

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This **Memorandum of Understanding** (the "**MoU**") is made by and between:

(1) **National Space Science Center** (the **"NSSC") of Chinese Academy of Sciences**, located at NO. 1 Nanertiao, Zhongguancun, Haidian District, Beijing, 100190, China.

NOTE: The headquarters of the International Meridian Circle Program is located in the Huairou Campus of NSSC. Before the official establishment of the International Meridian Circle Program Organization, related matters were handled by the IMCP Secretariat, which is affiliated with NSSC.

(2) **Chiang Mai University** , located at 239 Huay Kaew Rd, Suthep, Mueang Chiang Mai District, Chiang Mai 50200.

The NSSC is hereinafter referred to as a "**Party A**", Chiang Mai University is hereinafter referred to as a "**Party B**" and jointly as the "**Parties**".

BACKGROUND

The International Meridian Circle Program (IMCP) is a world-class international cooperation program conducted by a consortium of countries and institutes with the goal of understanding and possibly predicting the impacts of the different sources of natural and anthropic disturbances on the Earth's space weather and space climate. It achieves these objectives by deploying and operating a network of ground-based research and monitoring instruments along one or several great meridian circles and conducting joint research mainly based on the data produced by this network.

As a matter of principle, all members of the consortium share the goals and implement the means of cooperation briefly described in Appendix A to this MoU. The IMCP is a voluntary international collaboration in science, in which all consortium members adhere to the principle of openness, fairness and progressiveness, and are committed to contribute to the promotion of the UN SDGs.

Party A: National Space Science Center

NSSC is a research institution directly under the Chinese Academy of Sciences (CAS), dedicated to research in space science and application technology. It is a leading space research institute in China covering space physics, space environment, microwave remote sensing and space engineering technology. NSSC is the scientific and organizational entity leading the Chinese Meridian Project. The Chinese Meridian Project consists of a space environment monitoring network comprising 31 stations and nearly 300 sets of monitoring equipment, arranged in a "#" layout along the 100°E, 120°E meridians and the 40°N, 30°N parallels. It primarily focuses on collaborative monitoring from the Sun's surface to Earth. The stations and instrumentation of the Chinese Meridian Project listed in Appendix B can be incorporated into the IMCP network and share data within the IMCP framework. NSSC is collaborating with all institutions/organizations that have signed the present MoU to work with them on implementing the IMCP, using the Chinese Meridian Program as its model of cooperation.

The **International Meridian Circle Program is a consortium of countries and institutes**

active in space weather that have agreed to serve the goals and implement the means of cooperation as described in Appendix A. Pending the future creation of one or several Advanced Study Institutes to conduct its operations, the IMCP is an international consortium of independent research entities whose operations are supported by NSSC.

Party B: Chiang Mai University

Chiang Mai University has a vision to promote frontier sciences, including research on Earth-Space System. The Earth-Space Ecology (ESE) research group at Chiang Mai University aims to develop tools and systems for space weather research in Thailand, as well as to establish a space weather database for preparedness, monitoring, and disaster warning of space hazards. To serve as a central hub for space-related research conducted by highly specialized researchers, we have fostered the creation of internationally recognized research and innovations in the field of space, as presented in Appendix C. Our goal is to position Chiang Mai University as a leading institution for space research globally.

ESE focuses on the study of Earth-Space relations and the impacts from space phenomena on life on Earth. As part of our mission for the nation, we also promote the development of learning materials and the dissemination of space-related knowledge to the general public. This aims to enhance understanding of space physics, space hazards, and astrobiology, inspire young people to take an interest in science, and prepare the global population for the era of the space economy. As detailed in Appendix D, our instruments connect Chiang Mai University's research with the global neutron monitor network, fostering further scientific collaboration.

The two **Parties** have entered into this MoU to collaborate on one or several of the four Pillars of the IMCP described in Appendix A (scientific research, network development, data sharing and dissemination and international networking activities) with the objective of serving the goals of the Program, advancing research on space weather and space climate and maximizing their benefits for all of Humankind and for the protection of the Earth's environment at large.

1. RESPONSIBILITIES

Party B will use all reasonable efforts to promote IMCP and contribute to its different activities under the coordination of NSSC, such as and not limited to:

i) engage in bilateral and multilateral cooperation within the framework of IMCP, as well as support and promote the establishment of an international organization for the IMCP;

ii) carry out joint observations based on their own monitoring facilities;

iii) explore data sharing;

iv) support and promote the future planning, development, and deployment of new monitoring facilities;

v) promote joint space weather research such as joint application for funding projects, collaborative publication of articles, etc;

vi) support activities related to IMCP, such as hosting and participating in workshops, space weather schools as well as seminars;

vii) conduct personnel exchanges such as short-term visits, joint training, academic exchanges, etc.

2. PERSONNEL

2.1 The Parties shall ensure the selection of personnel with the necessary skills and competence to take part in the activities under this MoU.

2.2 Each Party personnel shall remain employees of their home institutions, which, as employers, shall each bear exclusive responsibility for the remuneration, social security and insurance of its personnel. Each Party shall indemnify and hold the other Party harmless from any liability in this respect.

3. FINANCE

3.1 Except as otherwise stated in the MoU, Each Party shall bear its own costs and expenses incurred in connection with this MoU, including the negotiation and finalization of any Agreement.

3.2 Any financial, in-kind or effort contributions related to a project under this MoU shall be formally agreed in an Agreement.

4. INTELLECTUAL PROPERTY

Any intellectual property to arise from this collaboration should be aligned with the mutual interests of both parties and comply with the laws and regulations of their respective countries.

5. DURATION AND TERMINATION

5.1 This MoU shall enter into effect upon signing of it by both Parties, shall have a duration of 5 years.

5.2 Either Party may terminate this MoU, for any reason, by giving the other Party a written notice six months in advance.

6. AMENDMENTS

Amendments to or changes of this MoU shall, in order to be valid, be made in writing and signed by authorized representatives of both Parties and shall be clearly stated as amendments to or changes of this MoU, as the case may be.

7. SETTLEMENT OF DISPUTES

In any dispute, difference or question between the Parties arising out of or in connection with this MoU the Parties will attempt in good faith to settle it by negotiation.

This MoU has been executed in two (2) originals, of which the Parties have received one (1) each.

National Space Science Center, Chinese Academy of Sciences	Chiang Mai University,
Signature 2025.8.25	*Signature*
Chi WANG Director General of NSSC	Pongruk SRIBANDITMONGKOL President of Chiang Mai University

Appendix A.

IMCP STATEMENT OF GOALS AND MEANS OF COOPERATION

The International Meridian Circle Program (IMCP) is an international research and monitoring program aiming at understanding and possibly predicting the impacts of the different sources of natural and anthropic disturbances on the Ionosphere, Middle and Upper Atmosphere (IMUA), which is the interface with the domain of the Earth's environment dominated by neutral atmosphere processes and the overlying domain of the Earth's environment – ionosphere, magnetosphere and interplanetary space – dominated by magnetized plasma processes. The overarching goal of the IMCP is to quantitatively explore these impacts over a broad range of temporal scales, from minutes or so (with implications for Space Weather) to the multi-decadal scale (with implications for Space Climate). In line with this goal, the research priorities of IMCP include but are not limited to the study of the impact on the Earth's space environment of the main types of disturbances: solar eruptions and other solar disturbances; energy transport and global disturbances in the magnetosphere; secular variations of the geomagnetic field; lower atmosphere weather and climate; variations of the global atmospheric circuit; natural hazards and disasters originating at the Earth's surface, interior and core.

To achieve its research objectives, the IMCP deploys and coordinates a global ground-based network of research and monitoring instruments. Optimally designed to capture the space and time variability of these different processes, the IMCP network consists of several meridional chains of instruments monitoring the IMUA, complemented by additional instruments dedicated to the characterization of the different sources of disturbances described above, starting with monitoring of solar and interplanetary space activity. While each meridional chain aims at achieving a full-latitude coverage of space weather processes, the combination of its different meridional chains provides unique additional longitude and local time coverage. The primary chain is deployed along the 120° E - 60° W longitudes, while a second chain is currently planned to be deployed later, in longitude quadrature with the first one, along the 30° E - 150° W longitudes.

Deployment and operation of the IMCP will involve countries and institutes operating instruments along its meridian(s) who have voluntarily joined the project, adhere to its scientific objectives and agreed to contribute to the development of its **four PILLARS**:

- **Joint research activities** using data from the network;
- **Deployment and operation of instruments** along the IMCP Meridian(s);
- **Exchange of data** and development of data systems in support to IMCP projects;
- **Tools and networking activities enabling international cooperation**.

The IMCP is a voluntary international collaboration in science, whose all partners adhere to the principle of openness, fairness, and progressiveness, and contribute to the promotion of the UN SDGs.

Appendix B: Stations and instrumentation of the Chinese Meridian Project

(https://www.meridianproject.ac.cn/en/)

Ind.	Station	Obs. Site	Phase I	Phase II
1	MoHe	OMOHE* 120.0° E,53.0° N,300m	Meteor Radar Digital Ionosonde GNSS Ionospheric TEC and Scintillation Monitor Manual Magnetic Fluxgate Theodolite Flux-Gate Magnetometer Overhauser Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor	GNSS Ionospheric TEC and Scintillation Monitor High Frequency Doppler Shift Monitor Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer Middle-upper Atmosphere Wind-Temperature - Metal-Constituents Lidar Wideband Magnetic Field Wave Monitor ULF Magnetic Field Wave Monitor
		OLGHE 121.6° E,53.4° N,300m		High Frequency Doppler Shift Monitor
		OMHBJ		High Frequency Doppler Shift Monitor
		OMXLJ 122.5° E,53.0° N,440m		High Frequency Doppler Shift Monitor
		OYAKS 121.7° E,50.5° N,730m		Flux-Gate Magnetometer
2	ManZhou Li	OMZLN 117.5° E,49.6° N,680m	Flux-Gate Magnetometer Search Coil Magnetometer Geoelectric Field Monitor	Automatic Magnetic Fluxgate Theodolite Overhauser Magnetometer
		OMZLB 117.5° E,49.6° N,560m	Digital Ionosonde	GNSS Ionospheric TEC and Scintillation Monitor
3	ChangChun	ONOAN 125.0° E,44.0° N,190m	Flux-Gate Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor Geoelectric Field Monitor	Low Frequency Magnetic Field Wave Receiver Dual-Channel All Sky Airglow Imager

Ind.	Station	Obs. Site	Phase I	Phase II
		OGZHL 124.9° E,43.9° N,190m	Digital Ionosonde	GNSS Ionospheric TEC and Scintillation Monitor
		OYANJ 129.5° E,42.9° N,400m		GNSS Ionospheric TEC and Scintillation Monitor
		OLONJ 129.4° E,42.8° N,350m		Mid-latitude High Frequency Coherent Scattering Radar
4	BeiJing	OYANQ 116.0° E,40.4° N,550m	Light Detection and Ranging (LIDAR)	
		OCXBW 116.3° E,40.1° N,50m	Neutron Ray Counter	
		OMBLT 117.0° E,40.6° N,160m	Inter-Planetary Scintillation Telescope	
		OXINL 117.6° E,40.4° N	All Sky Airglow Imager Optical Fabry-Perot Interferometer	
		OCSSL 116.2° E,40.3° N,180m	GNSS Ionospheric TEC and Scintillation Monitor Manual Magnetic Fluxgate Theodolite Flux-Gate Magnetometer Overhauser Magnetometer Search Coil Magnetometer	GNSS Ionospheric TEC and Scintillation Monitor Meteor Radar Wideband Magnetic Field Wave Monitor
		OCHLG 116.3° E,40.1° N,40m	Digital Ionosonde	
		OHDBD 116.3° E,40.0° N,50m	High Frequency Doppler Shift Monitor Ionospheric TEC and Scintillation Monitor	High Frequency Doppler Shift Monitor
		OMXWZ 116.9° E,40.5° N,120m	High Frequency Doppler Shift Monitor Ionospheric TEC and Scintillation Monitor	High Frequency Doppler Shift Monitor

Ind.	Station	Obs. Site	Phase I	Phase II
		OCBED 116.2° E,40.3° N,100m	High Frequency Doppler Shift Monitor Ionospheric TEC and Scintillation Monitor	High Frequency Doppler Shift Monitor
		OXIHE 117.0° E,39.7° N,20m	MST Radar	
		OHRYQ 116.7° E,40.3° N,70m		High Frequency Doppler Shift Monitor
		OHRQZ 116.6° E,40.3° N,60m		Solar Magnetism and Activity Telescope
5	XinXiang	OXXMY 113.9° E,35.3° N,70m	GNSS Ionospheric TEC and Scintillation Monitor	GNSS Ionospheric TEC and Scintillation Monitor
		OTANC 118.3° E,34.7° N,110m	Flux-Gate Magnetometer Search Coil Magnetometer	
		OLIGY 119.0° E,35.0° N,70m		Solar Full-disk Multi-layer Magnetograph
		OXYWC 108.7° E,34.4° N,420m		GNSS Ionospheric TEC and Scintillation Monitor
6	HeFei	OBHKD 117.3° E,31.8° N,20m	Light Detection and Ranging (LIDAR)	GNSS Ionospheric TEC and Scintillation Monitor
7	WuHan	OWCWD 114.4° E,30.5° N,40m	Light Detection and Ranging (LIDAR)	High Frequency Doppler Shift Monitor Middle and Low Atmosphere Temperature Lidar
		OCHYA 114.1° E,29.5° N,70m	MST Radar	High Frequency Doppler Shift Monitor
		Xiantao		High Frequency Doppler Shift Monitor
		OWHHP 114.5° E,31.0° N,50m	GNSS Ionospheric TEC and Scintillation Monitor Digital Ionosonde Meteor Radar	GNSS Ionospheric TEC and Scintillation Monitor Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer
		OENSH 109.5° E,30.3° N,490m		Flux-Gate Magnetometer

Ind.	Station	Obs. Site	Phase I	Phase II
		OSZZD 113.3° E,31.6° N,140m		High Frequency Doppler Shift Monitor
		OYICH 113.3° E,30.9° N,60m	Flux-Gate Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor Geoelectric Field Monitor	Automatic Magnetic Fluxgate Theodolite Proton Precession Magnetometer
		ONCDH 115.8° E,28.7° N,30m		GNSS Ionospheric TEC and Scintillation Monitor
8	GuangZhou	OZHQI 112.5° E,23.0° N,10m	Flux-Gate Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor Geoelectric Field Monitor	
		OSHYA 111.5° E,27.2° N,300m	Flux-Gate Magnetometer Search Coil Magnetometer	Overhauser Magnetometer
		OGZTH 113.4° E,23.1° N,10m	Digital Ionosonde	
		OGZYX 113.3° E,23.1° N,40m	Muon Ray Telescope	
9	ShenZhen	OSZNS 114.0° E,22.6° N,20m	High Frequency Doppler Shift Monitor Ionospheric TEC and Scintillation Monitor	High Frequency Doppler Shift Monitor
		OZHXZ 113.6° E,22.4° N,30m		High Frequency Doppler Shift Monitor
		OBOLU 114.5° E,23.5° N,30m		High Frequency Doppler Shift Monitor Digital Ionosonde Meteor Radar Middle and Low Atmosphere Temperature Lidar Middle and Low Atmosphere Constituents Lida GNSS Ionospheric TEC and Scintillation Monitor

Ind.	Station	Obs. Site	Phase I	Phase II
		OXGJL 114.2° E,22.3° N,40m		High Frequency Doppler Shift Monitor
10	HaiNan	OHKLH 110.4° E,20.0° N,20m	Light Detection and Ranging (LIDAR)	
		ODAZH 109.1° E,19.5° N,30m	All Sky Airglow Imager GNSS Ionospheric TEC and Scintillation Monitor VERY HIGH FREQUENCY COHERENT SCATTERING RADAR Digital Ionosonde	GNSS Ionospheric TEC and Scintillation Monitor Triple-Station Incoherent Scattering Radar Dual-Channel Optical Interferometer Array Large Aperture Lidar Thermosphere Sounding Rocket Ionosphere Sounding Rocket
		OSAYA 109.6° E,18.4° N,50m		Triple-Station Incoherent Scattering Radar
		OLEDO 109.0° E,18.4° N,60m	Manual Magnetic Fluxgate Theodolite Flux-Gate Magnetometer Overhauser Magnetometer Search Coil Magnetometer	Wideband Magnetic Field Wave Monitor
		ODFNG 108.8° E,19.2° N,50m		Low-latitude High Frequency Coherent Scattering Radar GNSS Ionospheric TEC and Scintillation Monitor
		OQIZH 109.9° E,19.0° N,230m	Flux-Gate Magnetometer Search Coil Magnetometer	Overhauser Magnetometer
		OWCHG 110.8° E,19.6° N,20m		Triple-Station Incoherent Scattering Radar
		OHKQS		GNSS Ionospheric TEC and Scintillation Monitor

Ind.	Station	Obs. Site	Phase I	Phase II
		110.4° E,20.0° N,10m		
		OLANX 119.6° E,29.3° N,30m	Flux-Gate Magnetometer Search Coil Magnetometer	GNSS Ionospheric TEC and Scintillation Monitor
12	ChongQing	OCQSP 106.4° E,29.5° N,270m	Digital Ionosonde	GNSS Ionospheric TEC and Scintillation Monitor
13	QuJing	OZHYI 103.7° E,25.7° N,2020m	Incoherent Scattering Radar	
		OKMGD 102.8° E,25.0° N,1930m		Solar Disk Chromosphere Telescope
		OBINC 100.6° E,25.6° N,2040m		GNSS Ionospheric TEC and Scintillation Monitor Meteor Radar Digital Ionosonde Dual-Channel Optical Interferometer Dual-Channel All Sky Airglow Imager
14	ChengDu	OPIXI 103.9° E,30.8° N,560m	Flux-Gate Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor Geoelectric Field Monitor	
		OPUJI 103.6° E,30.3° N,480m		GNSS Ionospheric TEC and Scintillation Monitor Digital Ionosonde Meteor Radar
15	Lhasa	OLSCG 91.0° E,29.6° N,3630m	Flux-Gate Magnetometer Search Coil Magnetometer	Overhauser Magnetometer Automatic Magnetic Fluxgate Theodolite Proton Precession Magnetometer
		ODXYB 90.5° E,30.1° N,4290m		MST Radar Millimeter-Wave and Infrared Imager

Ind.	Station	Obs. Site	Phase I	Phase II
				Atmosphere Wind-Temperature Lidar
		ONQSN 92.4° E,31.7° N,300m		GNSS Ionospheric TEC and Scintillation Monitor Digital Ionosonde Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer Meteor Radar
16	MingAnTu	OXLHT 116.1° E,43.9° N,4520m		Flux-Gate Magnetometer Search Coil Magnetometer
		OMANT 115.3° E,42.2° N,1370m		Meter-Decameter Wave RadioHeliograph Decimetric Wave Solar Radio Spectrometer Centimetric Wave Solar Radio Spectrometer Inter-Planetary Scintillation Telescope Centimeter-Decimeter Wave RadioHeliograph
		OYHGL 115.1° E,44.7° N,1160m		Inter-Planetary Scintillation Telescope
		OWRGT 113.1° E,43.5° N,1080m		Inter-Planetary Scintillation Telescope
17	WeiHai	OWHWD 121.8° E,37.2° N,110m		GNSS Ionospheric TEC and Scintillation Monitor Digital Ionosonde Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer Meteor Radar
		ODLZS 112.8° E,39.6° N,140m		Flux-Gate Magnetometer Search Coil Magnetometer

Ind.	Station	Obs. Site	Phase I	Phase II
		OROCH 112.3° E,36.8° N,50m		Metric Wave Solar Radio Spectrometer
18	XiaMen	OXMJM 118.1° E,24.6° N,20m		GNSS Ionospheric TEC and Scintillation Monitor
		ONANA 118.5° E,25.0° N,40m		Flux-Gate Magnetometer Search Coil Magnetometer
19	NanNing	ONNQX 108.5° E,22.8° N,90m		GNSS Ionospheric TEC and Scintillation Monitor
		OGLDC 110.4° E,25.4° N,160m		Meteor Radar Digital Ionosonde Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer GNSS Ionospheric TEC and Scintillation Monitor
		OQZQB 108.7° E,22.1° N,20m		MST Radar
20	BaYinGuoLeng	OHEJI 83.7° E,42.9° N,2510m		Mid-latitude High Frequency Coherent Scattering Radar Dual-Channel Optical Interferometer Dual-Channel All Sky Airglow Imager
		OKERL 86.3° E,41.6° N,890m		Meteor Radar Digital Ionosonde GNSS Ionospheric TEC and Scintillation Monitor
21	Hohhot	OSIZW 111.9° E,41.8° N,1440m		GNSS Ionospheric TEC and Scintillation Monitor Mid-latitude High Frequency Coherent Scattering Radar Muon Ray Telescope Dual-Channel Optical Interferometer Dual-Channel All Sky Airglow Imager Low Frequency Magnetic Field Wave Receiver

Ind.	Station	Obs. Site	Phase I	Phase II
		OTYJY 112.5° E,37.7° N,700m		Flux-Gate Magnetometer
22	YinChuan	OHLAN 106.1° E,38.8° N,1470m		Automatic Magnetic Fluxgate Theodolite Overhauser Magnetometer Flux-Gate Magnetometer Search Coil Magnetometer
		OXINQ 106.3° E,38.5° N,1110m		GNSS Ionospheric TEC and Scintillation Monitor
23	JiaYuGuan	OJIYG 98.2° E,39.8° N,1720m		GNSS Ionospheric TEC and Scintillation Monitor Flux-Gate Magnetometer Automatic Magnetic Fluxgate Theodolite Overhauser Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor
24	Urumqi	OHUTB 87.0° E,44.4° N,440m		Flux-Gate Magnetometer Search Coil Magnetometer Low Frequency Magnetic Field Wave Receiver
		OQIMO 85.5° E,38.1° N,1250m		Search Coil Magnetometer Flux-Gate Magnetometer Overhauser Magnetometer Automatic Magnetic Fluxgate Theodolite
		OWLMQ 87.2° E,43.5° N,2080m		Middle-upper Atmosphere Wind-Temperature Lidar
25	Kashgar	OJSHI 76.8° E,39.5° N,1450m		GNSS Ionospheric TEC and Scintillation Monitor Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer Meteor Radar Digital Ionosonde

Ind.	Station	Obs. Site	Phase I	Phase II
		OKSHI 75.8° E,39.5° N,1310m		Proton Precession Magnetometer Flux-Gate Magnetometer Search Coil Magnetometer Overhauser Magnetometer Automatic Magnetic Fluxgate Theodolite
26	LanZhou	OYUZH 104.1° E,36.0° N,1960m		GNSS Ionospheric TEC and Scintillation Monitor Digital Ionosonde Dual-Channel All Sky Airglow Imager Dual-Channel Optical Interferometer Meteor Radar Low Frequency Magnetic Field Wave Receiver Middle-upper Atmosphere Wind-Temperature Lidar
		OGERM 94.9° E,36.4° N,2800m		Flux-Gate Magnetometer Search Coil Magnetometer
27	GanZi	OBATA 99.1° E,30.0° N,3000m		Proton Precession Magnetometer Automatic Magnetic Fluxgate Theodolite Overhauser Magnetometer Search Coil Magnetometer Flux-Gate Magnetometer
		ODACH 100.2° E,29.0° N,3830m		Circular Array Solar Radio Telescope
28	LiJiang	OYULO 100.0° E,26.7° N,3200m		Spectral Imaging CoronaGraph
		OSHJI 100.0° E,23.5° N,1060m		GNSS Ionospheric TEC and Scintillation Monitor Flux-Gate Magnetometer

Ind.	Station	Obs. Site	Phase I	Phase II
				Very High Frequency Coherent Scattering Radar
		OLJGC 100.2° E,27.0° N,3130m		Overhauser Magnetometer Flux-Gate Magnetometer Search Coil Magnetometer
29	ALi	OGAER 80.1° E,32.5° N,4410m		GNSS Ionospheric TEC and Scintillation Monitor Proton Precession Magnetometer Automatic Magnetic Fluxgate Theodolite Overhauser Magnetometer Flux-Gate Magnetometer Search Coil Magnetometer Atmospheric Electric Field Monitor
		OLYBY 16.0° E,78.2° N,520m		Dual-Wavelength Fabry-Perot Interferometer All Sky Aurora Imager
		OUICE 21.9° E,64.1° N, 0m		Atmospheric Electric Field Monitor
31	Antarctic	OZHSH 76.4° E,69.4° N,10m	Aurora Spectrometer VHF Coherent Scatter Radar Digital Ionosonde Manual Magnetic Fluxgate Theodolite Flux-Gate Magnetometer Overhauser Magnetometer	Atmospheric Electric Field Monitor
		OCHCH 59.0° E,62.2° N,20m		Absolute Flux-Gate Magnetometer Search Coil Magnetometer Search Coil Magnetometer GNSS Ionospheric TEC and Scintillation Monitor

Ind.	Station	Obs. Site	Phase I	Phase II
				Whistle Wave Monitor Digital Ionosonde

Appendix C: ESE STATEMENT OF GOALS AND MEANS OF COOPERATION

The Earth-Space Ecology (ESE) research group at Chiang Mai University, Thailand, leads collaborative efforts in studying space weather and cosmic rays through ground-based observations and their impact on Earth-space ecology. The group actively partners with various international research institutes to advance knowledge in particle physics, cosmic rays, atmospheric physics, space weather, and Earth-space ecology. One of the group's key projects is THIMON (Thailand-Hawaii Neutron Monitor), a three-tube standard NM64 neutron monitor developed at Chiang Mai University. This initiative has received substantial support, including a donated spare shipping container from Shinshu University and electronic boards and a rack from the University of Delaware.

We strongly support a global ground-based network of research and monitoring instruments. Our facilities will serve as a additional tools to tighten the development and discovery in Space Physics, Particle Physics researches. We there for adhere the agreement on collaboration of the **four PILLARS**:

- **Joint research activities** using data from the network;
- **Deployment and operation of instruments** along the IMCP Meridian(s);
- **Exchange of data** and development of data systems in support to IMCP projects;
- **Tools and networking activities enabling international cooperation**.

With our strong support for the international collaboration in science, we adhere to the principle of openness, fairness, and progressiveness.

Appendix D: Instrumentation of Chiang Mai University

1. Changvan Neutron Monitor:

Changvan is a semi-leaded neutron monitor designed and developed by Chiang Mai University as part of an initiative by Her Royal Highness Princess Maha Chakri Sirindhorn to enhance cosmic ray and space weather research in Thailand. The project is led by Prof. Waraporn Nuntiyakul from Chiang Mai University (CMU), who serves as the Principal Investigator (PI).

International Collaboration

The development and deployment of Changvan are part of Thailand's collaboration in polar science with **China's Arctic and Antarctic Administration** under the State Oceanic Administration. The partnership includes:

- Scientific exchange between Thai and Chinese researchers.
- Joint studies on climate change, biotechnology, and space weather.
- Support for Thai scientists participating in Chinese Antarctic Research Expeditions.
- Conservation efforts to protect the pristine Antarctic environment.

2. THIMON:

THIMON (Thailand-Hawaii Neutron Monitor) is a three-tube standard NM64 neutron monitor developed by Chiang Mai University. The project benefited from generous contributions, including a spare shipping container from **Shinshu University** and electronic boards and a rack from the **University of Delaware**. Designed for high mobility and adaptability, THIMON is capable of functioning in various environments, ranging from high-altitude observatories to remote research locations.

International Collaboration

THIMON was originally designed to detect solar neutrons, making the Haleakalā site in Hawaii an optimal deployment location. To support this effort, we collaborated with Prof. Veronica Bindi from the **University of Hawai'i at Mānoa (UHM)** for site coordination and placement. In addition to studying solar neutrons, we plan to integrate THIMON into a latitude survey project, similar to the mobile Changvan neutron monitor, which features a comparable design. Our long-term vision includes deploying THIMON on a U.S. Coast Guard icebreaker to conduct measurements in polar regions when suitable opportunities arise.

3. Station of Chiang Mai University

(https://www.cmu-gnss.science.cmu.ac.th)

Ind.	Station	Obs. Site
1	CMU01	Chiang Mai, Thailand 98 57 18.9 E, 18 48 07.94 N, 305.8m