

**1st GRUAN Implementation-Coordination Meeting (ICM-1)**  
Norman, Oklahoma, USA  
2-4 March 2009

Item 4

## **Initial GRUAN Sites – Invitation and Response Letters**

*(Submitted by GCOS Secretariat)*

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### **Summary and Purpose of Document**

This document contains the invitation letter sent to host organizations of initial GRUAN candidate sites, and the letters in response to this invitation received to date (as of 10 February 2009), all confirming support to the participation of those sites in GRUAN. As a result, there are currently six confirmed GRUAN sites out of fourteen initial candidate sites.

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## **Initial GRUAN Sites – Invitation and Response Letters**

This document contains the invitation letter sent to host organizations of initial GRUAN candidate sites (Annex I; example letter sent to MétéoSwiss, Switzerland), and the letters received to date in response to this invitation by WMO/GCOS Secretariat (Annex II).

The 2008 Lindenberg workshop decided on a set of 12 initial GRUAN candidate sites (GCOS-121, p. 25). With the subsequent decision by the WG ARO to add the US DoE ARM sites Manus Island (Papua New Guinea) and Republic of Nauru to that set, the total number of initial sites increased to 14. The Lindenberg site itself has been confirmed as a GRUAN site in the letter by Mr Wolfgang Kusch (Head, Deutscher Wetterdienst, Germany), dated 5 April 2007, in which DWD expressed its interest to host the GRUAN Lead Centre at the Meteorological Observatory Lindenberg, Germany.

Hence, invitation letters were sent by the WMO/GCOS Secretariat, on 5 September 2008, to:

- Dr Ir. Frits J J Brouwer (Head, KNMI, The Netherlands) (re Cabauw site)
- Mr Daniel Keuerleber-Burk (Head, MétéoSwiss, Switzerland) (re Payerne site)
- Prof Petteri Talaas (Head, Finnish Meteorological Institute) (re Sodankylä site)
- Dr Guoguang Zheng (Head, China Meteorological Administration) (re Xilinhot site)
- Prof Vincenzo Cuomo (Head, CNR IMAA, Italy) (re Tito Scalo (Potenza) site)
- Mr Neil Gordon (Head, Met Service New Zealand) (re Lauder site) (sent on 3 Oct 2008)
- Mr Howard Diamond (US GCOS Program Manager, NOAA NCDC, USA) (re all US and US-supported sites, i.e. Barrow, Beltsville, Boulder, Darwin, Lamont SWP, Manus Island, Republic of Nauru)

Response letters, all confirming support to the participation of those sites in GRUAN, have been received to date from (as of 10 February 2009):

- Dr Ir. Frits J J Brouwer (Head, KNMI, The Netherlands) (5 December 2008)
- Mr Daniel Keuerleber-Burk (Head, MétéoSwiss, Switzerland) (23 January 2009)
- Prof Petteri Talaas (Head, Finnish Meteorological Institute) (19 September 2008)
- Dr Guoguang Zheng (Head, China Meteorological Administration) (17 October 2008)
- Prof Vincenzo Cuomo (Head, CNR IMAA, Italy) (13 November 2008)

As a result, there are currently six confirmed GRUAN sites out of 14 candidate sites.

**Annex I:** Letter sent by the WMO Secretary-General to MétéoSwiss (as an example)

**Annex II:** Response letters received by WMO/GCOS Secretariat (as of 10 February 2009)

**Annex I:** Letter sent by the WMO Secretary-General to MétéoSwiss (Example)



World Meteorological Organization  
Organisation météorologique mondiale

Secrétariat  
7 bis, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse  
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wmo@wmo.int – www.wmo.int

TEMPS • CLIMAT • EAU  
WEATHER • CLIMATE • WATER

Our ref.: 5648-08/OBS/GCOS/GRUAN

Annexes: 3

Mr Daniel K. Keuerleber-Burk  
Permanent Representative of Switzerland  
with WMO  
MétéoSuisse  
Krählbühlstrasse 58  
Case postale 514  
CH-8044 Zurich  
Switzerland

GENEVA, 5 September 2008

Dear Mr Keuerleber-Burk,

The Global Climate Observing System (GCOS), supported by a number of international partners and the World Meteorological Organization (WMO), is establishing a new reference climate observation network, the GCOS Reference Upper Air Network (GRUAN). This network of about 30-40 reference sites worldwide has been designed to detect long-term trends of key climate variables, such as temperature and humidity, in the upper atmosphere, thus providing a cornerstone to more reliable monitoring of emerging signals of global and regional climate change.

The WMO Executive Council at its 60<sup>th</sup> session (June 2008) noted that the GRUAN “would provide high-quality observing sites for the atmospheric profile, including surface and upper-air measurements, in support of climate application, validation of satellite products and climate research.” It further requested WMO Members, “to support the implementation of the GRUAN, using wherever possible existing infrastructure.”

With this letter, I would like to invite you to consider the establishment of the Payerne observing station supported by MeteoSuisse as one of the initial GRUAN candidate sites. This selection follows a recommendation by the first meeting on the implementation of GRUAN (26-28 February 2008, Lindenberg, Germany) and subsequent endorsement by the Atmospheric Observation Panel for Climate (AOPC), which is co-sponsored by GCOS and the World Climate Research Programme.

GRUAN will address a serious deficiency in the existing global climate observing system, since upper-atmospheric trends are currently difficult to establish due to a lack of long-term observations of sufficient accuracy. This deficiency has been identified as a priority action in the “Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC” (GCOS-92) in 2004. The concept of and the requirements for GRUAN were developed at expert workshops in Boulder, USA (2005) and Seattle, USA (2006), held under the auspices of GCOS and the US National Oceanic and Atmospheric Administration.

Payerne maintained by MeteoSuisse has been selected as a GRUAN candidate site because of its significant experience in observing the atmospheric column, its ability to share expertise and resources with other site operators, and its great potential to contribute to the development of a wider GRUAN.

By accepting this invitation, you will be encouraged, in addition to the current activities of your NMHS, to further develop your contribution to GRUAN in collaboration with the GRUAN Lead Centre (hosted by the Deutscher Wetterdienst at its Lindenberg Observatory, Germany, and led by Dr Holger Vömel - see contact details below) and under the auspices of the AOPC Working Group on Atmospheric Reference Observations (WG-ARO) chaired by Mr Peter Thorne (UK Met Office).

Initial requirements for high-quality radiosondes (including frequency of launch) and surface instrumentation have been established for the initial set of GRUAN candidate sites, and are described in the reports GCOS-112 and GCOS-121 (see attached or available at <http://gcos.wmo.int>). A combination of radiosonde launches and surface observations is expected at each site, with redundant measurements of key climate variables, to provide the unique data required from GRUAN.

For the initial candidate sites, a start-up phase is foreseen during which instrument evaluations and network improvements will take place to optimize the observational strategy and the data quality envisioned for GRUAN. The full list of GRUAN site instrumentation requirements is given in GCOS-112 (section 6 and Appendix 1).

Recognizing these requirements, initial GRUAN candidate sites have been selected, wherever possible, based on the collocation with sites of existing global networks operated by WMO Members, such as the GCOS Upper-Air Network (GUAN), the Global Atmosphere Watch (GAW) and the Baseline Surface Radiation Network (BSRN), to ensure maximum synergy with these networks.

GRUAN requirements may change over time as the network evolves. Each GRUAN site is expected to participate actively in this development and to support the evolution of the network with best practices, periodic reviews and updates to their operations. The minimum requirements specified in GCOS-121 are seen as an entry level to the network. All GRUAN sites are requested to work towards reference-quality station instrumentation as time and resources permit, and based on the experience accumulated over time.

As for data dissemination, GRUAN will follow the data policy specified in WMO Resolution 40 (Cg-XII) by defining as 'essential' all data from the instrument systems given in GCOS-112 or any agreed revision of GCOS-112 at all GRUAN sites, in order to ensure the free and unrestricted availability of these data. Based on these principles, a draft initial data policy (see attached) has been developed by the Lead Centre, in cooperation with the WG-ARO, the GCOS Secretariat and AOPC. As an initial GRUAN candidate site, you are invited to provide input to this data policy before it is finalized.

The full definition of procedures for quality control and quality assurance (QC/QA) will be established at a later stage, based upon WMO practice and the lessons learned at each GRUAN site during an initial phase, as well as using input from other experts and research institutions.

In this initial phase, the GRUAN relies on the commitment and active engagement of the scientists and managers associated with each GRUAN site. Your expertise at the NMHS level and work towards the development of GRUAN is highly appreciated, and I am looking forward to your response and your active participation, contribution and cooperation with the Lead Centre in Lindenberg.

Yours sincerely,

(Hong Yan)  
for the Secretary-General

Contact details for GRUAN Lead Centre:

Dr Holger Vömel  
Deutscher Wetterdienst  
Meteorological Observatory Lindenberg / Richard-Assmann Observatory  
Am Observatorium 12  
D-15848 Tauche, Germany  
Tel.: +49 33677 60-244  
E-mail: [holger.voemel@dwd.de](mailto:holger.voemel@dwd.de)  
Web: <http://www.dwd.de/mol>

Please find attached as annexes:

- A. GCOS Reference Upper-Air Network (GRUAN): Justification, requirements, siting and instrumentation options, April 2007 (GCOS-112)
- B. GCOS Reference Upper Air Network (GRUAN): Report of the GRUAN Implementation Meeting, Lindenberg, Germany, 26-28 February 2008 (GCOS-121)
- C. GRUAN Data Policy (Draft, August 2008)

cc: Dr Bertrand Calpini, MétéoSwis, Payerne  
Dr Gabriela Seiz, GCOS National Coordinator, MétéoSwiss, Zurich  
President of RA VI

**Annex II:** Response letters received by WMO/GCOS Secretariat (as of 10 February 2009)

**Istituto di Metodologie per l'Analisi Ambientale**

IMAA - CNR - IMAA	
Tit:	F:
<b>N. 0002292</b>	<b>13/11/2008</b>



Global climate Observing System  
GCOS secretariat  
c/o World Meteorological Organization  
7 bis, Avenue de la Paix  
P.O Box No. 2300, CH-1211 Geneva 2, Switzerland  
E-mail: gcospo@wmo.int

Your ref: 5646-08/OBS/GCOS/GRUAN

Our reference: **Nomination of the CNR-IMAA observation site as an initial site in the GCOS reference Upper-Air Network (GRUAN) – Ref. Number: 0002292**

**The director of the “Istituto di Metodologie per l'Analisi Ambientale (IMAA)”  
of the Italian National Research Council (CNR)  
Prof. Vincenzo Cuomo**

- considering the invitation letter, sent by the Secretariat of the Global Climate Observing System (GCOS) on 5 September, inviting the nomination of the Tito Scalo (Potenza) atmospheric observing station supported by CNR-IMAA as one of the initial sites in the GCOS Reference Upper-Air Network (GRUAN);
- considering the strong scientific interest of the CNR-IMAA in participating to GRUAN and in contributing to the development of a wider network for Upper-Air observations;
- considering that the equipment of the Tito Scalo atmospheric observing facility satisfies the minimum requirements specified in GCOS-121,

expresses his interest in participating to GRUAN and states the availability to establish the Tito Scalo (Potenza) atmospheric observing station supported by CNR-IMAA as one of the initial sites operative in the frame GRUAN. The CNR-IMAA will participate to the network activities and progress meetings, ensuring the satisfaction of the requirements for the measurements to provide to GRUAN and to actively support the development and the evolution of the network with best practices, period reviews and updates to the site operations.

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Your Sincerely,

*Vincenzo Cuomo*

**The Director of the CNR-IMAA  
Prof. Vincenzo Cuomo**



S.B.

*To follow up starting  
with thanks letter*

25.11.08

*[Signature]*





# 中国气象局

## CHINA METEOROLOGICAL ADMINISTRATION

46 Zhongguancun Nandajie, Beijing 100081, China



**Date:** 17 October 2008

**To:** Mr. M. Jarraud, Secretary-General, WMO

**Fax No.:** 00 41 22 730 8181

**From:** Dr. ZHENG Guoguang, Permanent Representative of China with WMO

**Number of pages including this one:** 1

Our Ref.: CMA /F1/WMO/08-179

**Subject:** Establishment of Xilinhot Observing Station as a GRUAN Candidate Site

Dear Mr. M. Jarraud,

Thank you for your letter of 5 September 2008 (ref: 5648-08/OBS/GCOS/GRUAN), inviting the Xilinhot Observing Station supported by CMA to be one of the initial GRUAN candidate sites.

A technical assessment was carried out after receiving your invitation, which shows that Xilinhot Observing Station is up to the standard for GRUAN candidate sites. Therefore, I am very pleased to accept your recommendation to establish Xilinhot Observing Station as one of the initial GRUAN candidate sites. I also would like to nominate Mr. XIONG Yi as the focal point on this matter, whose contact details are as follows:

Mr. XIONG Yi

Department of Observation and Telecommunication

China Meteorological Administration

46, Zhongguancun Nandajie,

Beijing 100081, China

Tel: (86 10) 68407042

E-mail: bear\_one@tom.com

Recd WMO REGISTRY (4)	21 OCT. 2008
18355-08 OBS/GCOS/ GRUAN	
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With my best personal regards,

Sincerely yours,

(ZHENG Guoguang)  
Permanent Representative  
of China with WMO

*S.B.*  
*To follow up, as required*  
*(starting with "thanks letter")*  
*21.10.08*



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**FINNISH METEOROLOGICAL INSTITUTE****Director General**

Address: Erik Palménin Aukio 1, P.O. Box 503, FIN-00101 Helsinki

Tel: +358-9-1929 2200, telefax: +358-9-1929 2203

To: Mr Michel Jarraud, Secretary General, WMO  
Fax: + 41 22 730 81 81  
Date: 19 September 2008  
From: Prof. Petteri Taalas, Permanent Representative of Finland with WMO  
Pages: 1

Dear Sir,

Reference is made to your letter of 5 September 2008 concerning your invitation to consider Sodankylä observing station as one initial candidate site for the GCOS Reference Upper Air Network, GRUAN. I am very pleased to confirm that we are very interested to have Sodankylä as a candidate site for the GRUAN network.

Yours sincerely

Petteri Taalas  
PR of Finland with WMO

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S.B. ✓

1. For actions, as appropriate
  2. Please draft a "thanks" letter (a shorter version of that we sent to Germany, as a lead center)
- 23.09.08



World Meteorological Organization  
Attn. Mr. M. Jarraud,  
Secretary General  
7 bis, avenue de la Paix  
Case Postale 2300  
CH 1211-Geneve 2  
Zwitserland

Subject  
The establishment of Cabauw as an initial candidate GRUAN  
Profiling Site

Date  
December 05, 2008  
Our reference  
KNMI-2008/2376  
Your reference  
5648-08/OBS/GCOS/GRUAN  
Contact  
A.T.F. Grooters  
  
Direct dialling number  
+31 30 2206691  
Enclosure(s)

Dear Mr. Jarraud,

Thank you very much for your letter of 5 September 2008 (ref. 5648-08/OBS/GCOS/GRUAN) in which you invite KNMI to consider the establishment of the Cabauw Observing Station as one of the initial GCOS Reference Upper -Air Network (GRUAN) sites.

I am pleased to inform you, that we can honour this request.

KNMI is committed to contribute to climate observations of the highest quality under the auspices of GCOS. With the Cabauw Observing Station, KNMI has the opportunity to work towards the ambition of GCOS in the establishment of a worldwide network of profiling stations that adhere to the highest observation standards. KNMI, together with national partners organised in the Cabauw Experimental Site for Atmospheric Research (CESAR) consortium, has many of the tools in place to make the Dutch contribution to GRUAN successful. Here we build on more than three decades of developing and maintaining a measurement system of columnar atmospheric observations, including the tower itself and the remote sensing and in situ measurement systems. We realize that the establishment of GRUAN is still in its initial phase. Through scientists that work towards keeping the Cabauw Station to the highest standards, KNMI will engage with the GRUAN community to contribute towards bringing this initial development towards fruition in the coming years. We welcome the establishment of Lindenberg as the lead GRUAN Centre. Our scientists have already had a long history of collaborative projects with the Lindenberg staff and will continue to do so in the future, in particular in areas of boundary layer and remote sensing.

We look forward to continue and even expand collaboration with our international partners in bringing the ideas of GRUAN towards successful completion.

Yours sincerely,

  
Dr. Frits J.J. Brouwer  
P.R. for The Netherlands with WMO

Rabobank International Utrecht, nr. 19.23.23.822

● ● ● ●  
KNMI, Ministry of Transport,  
Public Works and Water Management

Recd WMO REGISTRY (4)	11 DEC. 2008
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To follow up, starting with thanks letter 12.12.08	
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Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Federal Department of Home Affairs FDHA  
Federal Office of Meteorology and Climatology MeteoSwiss

MeteoSwiss, CH - 8044 Zurich

World Meteorological Organization  
Dr. Michel Jarraud  
Secretary-General  
7 bis, avenue de la Paix  
CH-1211 Genf  
Switzerland

Reference:  
Your Ref.: 5648-08/OBS/GCOS/GRUAN  
Our Ref.: aru/hen/IZ#2362  
Official in charge: Alex Rubli  
Zurich, 23 January 2009

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**Subject: GRUAN Candidate Station Payerne**

Dear Secretary-General,

Thank you for your letter of September 5th, 2008, concerning the future GRUAN network. I am pleased by your invitation to consider the establishment of the Payerne observing station as one of the initial GRUAN candidate sites. MeteoSwiss is well aware of the activities between WMO and its international partners regarding the plan of establishing a new reference climate observation network, the GCOS Reference Upper Air Network (GRUAN). We have been following the recent activities with great interest and our head of the Payerne observation station, Dr. Bertrand Calpini, has participated at the GRUAN implementation meeting at Lindenberg.

At the Payerne observing station, upper air measurements have been executed routinely since 1941. Balloon borne radiosondes measuring pressure, temperature and humidity are operationally launched twice a day (00 and 12 UTC) and wind profiles are obtained four times a day (00 06 12 18 UTC). Ozone profiles are measured three times per week. Because of its long time series of operational radiosonde profiles, the only Swiss aerological station, Payerne, is a recognized site for troposphere climate change investigations in central Europe.

Aerological radiosonde profiling at Payerne has been expanded in recent years with ground-based remote sensing profiling techniques (see also Annex A). Wind profilers were first introduced in the 1990s and are now routinely operated at the station. Temperature and humidity profiles are measured with different types of microwave radiometers, and a new LIDAR system has recently been installed at Payerne for operational water vapor profile measurements. While remote sensing systems have limited altitude performances, they largely improve temporal resolution, providing temperature, humidity and wind profiles every ten or thirty minutes for present weather analysis and for high temporal resolution weather prediction model assimilation.

Alex Rubli  
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alex.rubli@meteoswiss.ch  
www.meteoswiss.ch

S.B.  
To follow-up  
starting with thanks  
letter  
27.01.09  
Q



With a long tradition of using its own Swiss SRS400 radiosonde, the Payerne aerological station has been collaborating with radiosonde manufacturers since decades and has been playing an important role in a large number of international radiosonde intercomparisons. Within the European COST Action ES0702 - European Ground-Based Observations of Essential Variables for Climate and Operational Meteorology - (EG-CLIMET ), we presently establish a research program investigating the uncertainty of radiosonde profiles and integrating the different upper-air profiling systems, with the final goal of establishing a reference for upper air temperature and humidity profile measurements. These activities are well within the aims and goals of the GRUAN initiative.

The Payerne observing station was recently included in the GCOS Upper-Air Network (GUAN), and with long tradition in surface radiation measurements it has been part of the WMO Global Atmosphere Watch (GAW) and the Baseline Surface Radiation Network (BSRN) since the start of these programs in the early 1990s. In collaboration with the World Radiation Center (WRC) in Davos, Payerne observations and research contributions have been important for the GAW and BSRN programs.

Given the above mentioned circumstances and current efforts at Payerne to further develop and foster high-quality radiosondes and remote sensing techniques to improve upper air profile quality and temporal resolution, we consider the participation in GRUAN as a chance to share expertise and resources with international partners and see great potential to contribute to improved weather prediction and climate observation. We therefore are very pleased to accept your invitation to establish a GRUAN site at our Payerne atmospheric observing station. We very much look forward to a continued fruitful collaboration with WMO and the international upper-air community.

Sincerely yours,  
Federal Office of Meteorology and Climatology MeteoSwiss



Daniel K. Keuerleber-Burk  
Director  
Permanent Representative of Switzerland with WMO

Annex:  
Description of MeteoSwiss Payerne atmospheric observatory

Contact person:  
Dr. Dominique Ruffieux  
MétéoSuisse  
Station aérologique  
Case postale 316  
CH-1530 Payerne  
Phone: +4126 662 6247  
Email: dominique.ruffieux@meteoswiss.ch



## Annex A

### Description of MeteoSwiss Payerne atmospheric observing station

Payerne is the principal atmospheric observing station of Switzerland. It is equipped with operational and research surface and upper air measurement systems and part of several international long-term monitoring networks and research projects. Other measurement systems are located at higher altitudes within the Alps at some distance from Payerne up to 3500 m asl (Jungfraujoch). Both in-situ and surface based remote sensing techniques are used. The main objectives are the monitoring of a vertical atmospheric column on a long-term basis, the quality assurance of atmospheric measurement systems, as well as the validation of the numerical weather prediction models. The measurements meet the requirements of several international networks (GSN, GUAN, GAW, BSRN, NDAC, EMEP). The Payerne observatory is also presently involved in several COST projects and has a close collaboration with several national and international research groups.

Location: 46.8 N, 7.0 E, 491m (asl), hilly terrain on the Swiss Mittleland between the Jura Mountains and the Alps. Main measurement systems:

#### Profiling

- Operational radiosonde station (4 soundings per day, 3 ozone soundings per week, 1 tropospheric "reference" humidity sounding per month)
- Operational Low Level Windprofiler (1290 MHz)
- Operational Ceilometer
- Operational Ozone microwave radiometer
- Operational Microwave temperature and water vapour radiometers
- Operational Water vapour Raman lidar
- Operational GPS antenna (water vapour column)

#### Surface

- Operational surface meteorological station, as well as test facilities
- Operational surface radiation measurements (full Baseline Surface Radiation Network programme + UV components + surface layer measurements on a 30 m mast),
- Operational surface air pollution station

Coordinated Alpine sites near Payerne:

- Arosa (Dobson and Brewer ozone spectrophotometers),
- Jungfraujoch (full in-situ aerosol GAW-programme operated by research institutes)
- Zimmerwald (GPS and microwave systems, Uni Bern)
- At other sites: 3D operational precipitation radars as well as radiation monitoring stations.

Additional information can be found in the following web-sites:

<http://www.meto.gov.uk/research/interproj/cwinde/profiler/payerne/index.html>

[http://www.meteosuisse.admin.ch/web/en/climate/climate\\_international.html](http://www.meteosuisse.admin.ch/web/en/climate/climate_international.html)

<http://www.meteosuisse.admin.ch/web/en/research/projects/cn-met.html>

<http://www.meteosuisse.admin.ch/web/en/research/projects/lidar.html>

[http://www.meteosuisse.admin.ch/web/en/weather/ozone\\_layer.html](http://www.meteosuisse.admin.ch/web/en/weather/ozone_layer.html)

Contact: dominique.ruffieux@meteoswiss.ch

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