
COMMISSION FOR BASIC SYSTEMS
OPEN PROGRAMME AREA GROUP
ON INTEGRATED OBSERVING SYSTEMS

EXPERT TEAM ON OBSERVATIONAL DATA REQUIREMENTS
AND REDESIGN OF THE GLOBAL OBSERVING SYSTEM

ITEM: 4

REDUCED SESSION

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**OSE: Information content of Siberian sonde network
and its impact areas evaluation**

(Submitted by Dr O. Pokrovsky, Main Geophysical Observatory, St.Petersburg, Russia)

Summary and purpose of Document

The document outlines the research study results carried out to evaluate the information content of observational data acquired from H500 height measurements at Siberian sonde network during last 50 years and in more details for last decade. This study had been performed accordingly to OSE plan accepted at Geneva meeting (April, 2001). The document contains some conclusions on evolving of these data contribution on analysis over 50-80-th latitude belt in Northern Hemisphere. It describes Siberian sonde network regioning and its main impact area: North America, Arctic and North Pacific Ocean.

ACTION PROPOSED:

The Expert Team is invited to consider information contained in this document when summarizing the results of proposed OSEs and updating its recommendations with respect to the redesign of the GOS.

Approach

Covariance matrix related to meteorological field is a sufficient statistics of a given measurement data sample and, therefore, might be used as a background unit in our study. Generalized Shannon Measure of Information Content (after Gelfand, Yaglom, 1957) based on covariance matrices was used for quantitative evaluation of observing system contribution in result of numerical analysis of H500 field at Northern Hemisphere. Statistical regioning technique based on analysis of empirical orthogonal functions (EOF), which are eigen vectors of covariance matrix, was implemented to divide Siberia region into set of homogeneous areas. Spectral analysis scheme was applied to investigate the quantitative contribution of measurement data into different spatial scale component analysis.

Data sets

NCEP and ECMWF reanalysis data sets for H500 daily fields were employed in this study. First data set responds two terms 00Z and 12 Z for 1955-99 years, second set responds only 12 Z term for 1979-93. So, main results obtained for NCEP data set.

Reanalysis sample data sets were used for covariance matrices computing. Siberian sonde network configuration was used in regioning and information content computations.

Study items

- Retrospective consideration of information content of data collected over Siberia for H500 analysis at 1955-1999
- Evaluation of sonde and satellite data impact in performance of different spatial scale components of H500
- Distribution of sonde stations within homogeneous zones for H500 field and launch statistics.
- Evaluation of impact H500 field data collected over Siberia on North America North Pacific Ocean and Arctic regions, its evolving during last fifty years.
- Plan formulation for future study

Results

1. H500 field variability index time series analysis proves that Siberian sonde network was developed in ascending mode till 1985 year and later its development was changed in descending mode. Inflection point at 1990 corresponds to substantial contribution of remote sensing data since late eighties and early nineties.
2. Spectral analysis of covariance matrices provides the H500 field variability splitting into large, medium and small spatial scales. It was shown that medium scale component (hundreds km), which is related to sonde network contribution, has one-modal structure with maximum at 1985, while the small scale component (tens km), which is related to satellite remote sensing system information impact, demonstrates a monotonous growth during nineties.
3. H500 observations carried out at East Siberian regions (Kamchatka peninsula, East-Siberian Sea coast and Yakutia) impact in analysis and short term weather forecasting over North America, Arctic Ocean and North Pacific area, correspondingly.
4. Temporal dependence of information impact of H500 observational data obtained over Siberia on North America region has a maximum achieved at 1996. This result might be explained as a superposition of two spatial scale components responded to sonde network and remote sensing system contributions. Information impact decreasing, which was occurred after 1996, is mainly determined by several times decreasing of number of sonde stations.

Plan for future study

- To substantiate some minimal network configuration and optimize scheme of sonde launches for Siberian area in so way as to guaranty its full financial support.
 - To investigate a proposed network variant relevance to different weather regime
 - To develop the recommendations for sonde network redesign, which will include number and location of sonde stations
 - To estimate the improvement rate of height and wind field analysis, when optimization of Siberian sonde network will be completed.
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