CGMS

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STATUS OF RUSSIAN DATA COLLECTION SYSTEM

This document addresses the current status and technical specifications of the Russian data collection system and related future plans. The DCS is established to provide collection and distribution of meteorological data from the remote areas and to support natural hazards warning system.

Roshydromet has developed and deployed the national DCS based on Electro-L series geostationary satellites with a backup option via Luch series communication satellite. The number of DCPs is now 679 DCPs allocated. DCPs are distributed all over the Russian territory, including 138 DCPs in hard-to-reach areas.

The orbital positions of Electro-L N2 & N3 are planned to be changed. Electro-L N3 will be moved to the position of 76ºE, and Electro-L N2 will take the position of 14.5ºW.

STATUS OF RUSSIAN DATA COLLECTION SYSTEM

1. INTRODUCTION

Russian data collection system (DCS) is established to provide satellite channels for meteorological data transmission from data collection platforms (DCPs) via meteorological satellites (backup option – via Luch communication satellites).

The DCS was developed according to the international requirements of WMO and CGMS and has to provide transmission of the messages every 3 hours (standard synoptic hours), and also storm warnings at any time.

2. TECHNICAL SPECIFICATIONS

DCS comprises of the network of DCPs at Roshydromet' observational sites, relay transponders at Russian satellites of Electro-L and Luch series, and ground reception stations at SRC Planeta satellite centers.

DCP signals are transmitted via dedicated satellite channels at frequency ranges of 401.5-402.5 MHz (uplink) and 1696.5-1697.5 MHz (downlink) with transmission rate of 100 or 1200 bps. The message size is up to 15 000 bit. The transmission time is synchronized with GLONASS/GPS signals.

System capacity allows data transmission from 300 DCPs simultaneously that provides throughput of 3000 DCPs in 10 minutes.

Russian DCS is developed for data transmission via geostationary meteorological satellites of Electro-L series (constellation of three spacecrafts to be located at 76E, 14.5W and 166E), polar-orbiting meteorological satellites of Meteor series (constellation of three spacecrafts), and highly elliptical orbit satellites of Arctica series (constellation of two spacecrafts), and also geostationary communication satellites of Luch series.

The constellation of Electro-L geostationary satellites (with backup option via Luch communication satellites) provides coverage of the territory from about 75ºS to about 75ºN, the highly elliptical orbit satellites will give the coverage of high Arctic latitudes, polar-orbiting satellites will cover the regions outside the area mentioned above, but less frequently (see Figure 1).

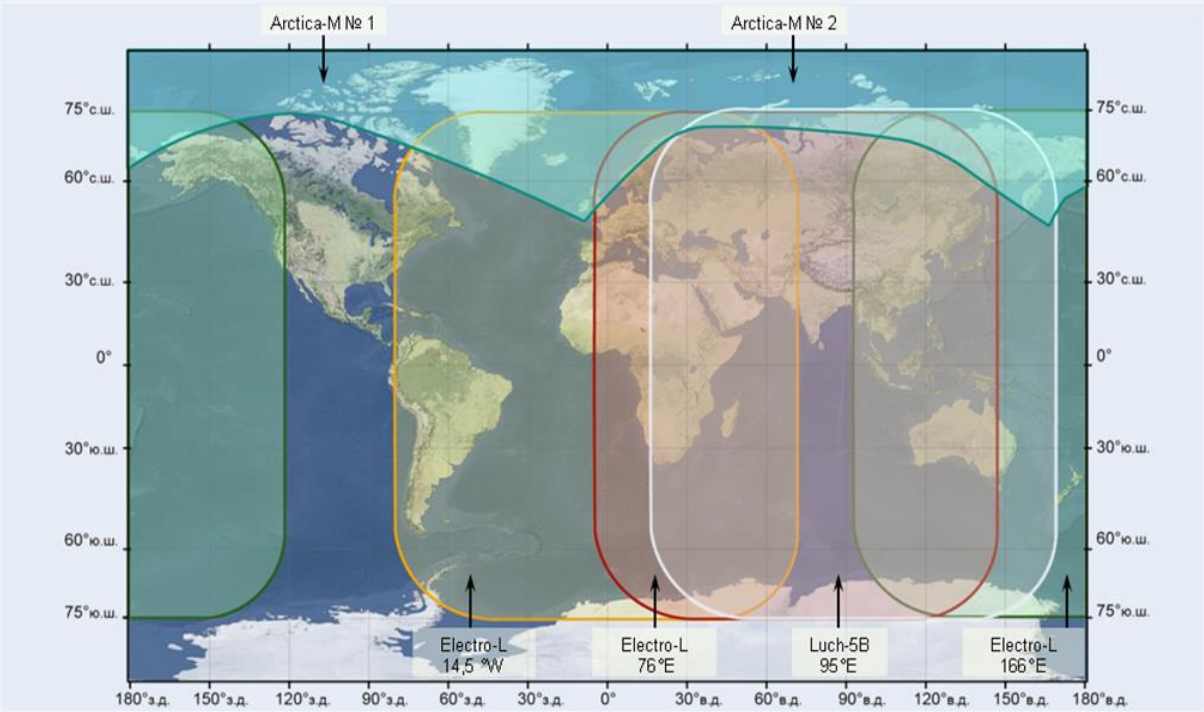

Figure 1: The coverage of Russian geostationary and highly elliptical orbit satellites.

3. CURRENT STATUS

Roshydromet has developed and deployed the national DCS based on Electro-L series geostationary satellites with backup option via Luch series communication satellite. The DCS is based on the national technical equipment.

As shown in Figures 2, 3 messages transmitted from DCPs to Electro-L (76E, 166E) and Luch-5B (95E) are relayed to the European (Moscow region), Siberian (Novosibirsk) and Far Eastern (Khabarovsk) satellite centers of SRC Planeta.

The number of DCPs is now 679 DCPs allocated (May 2020). DCPs are distributed all over the whole territory of Russia, including 138 DCPs in hard-to reach areas (Figure 4). The national DCS has a reliability of 99.8 % based on the number of messages successfully received.

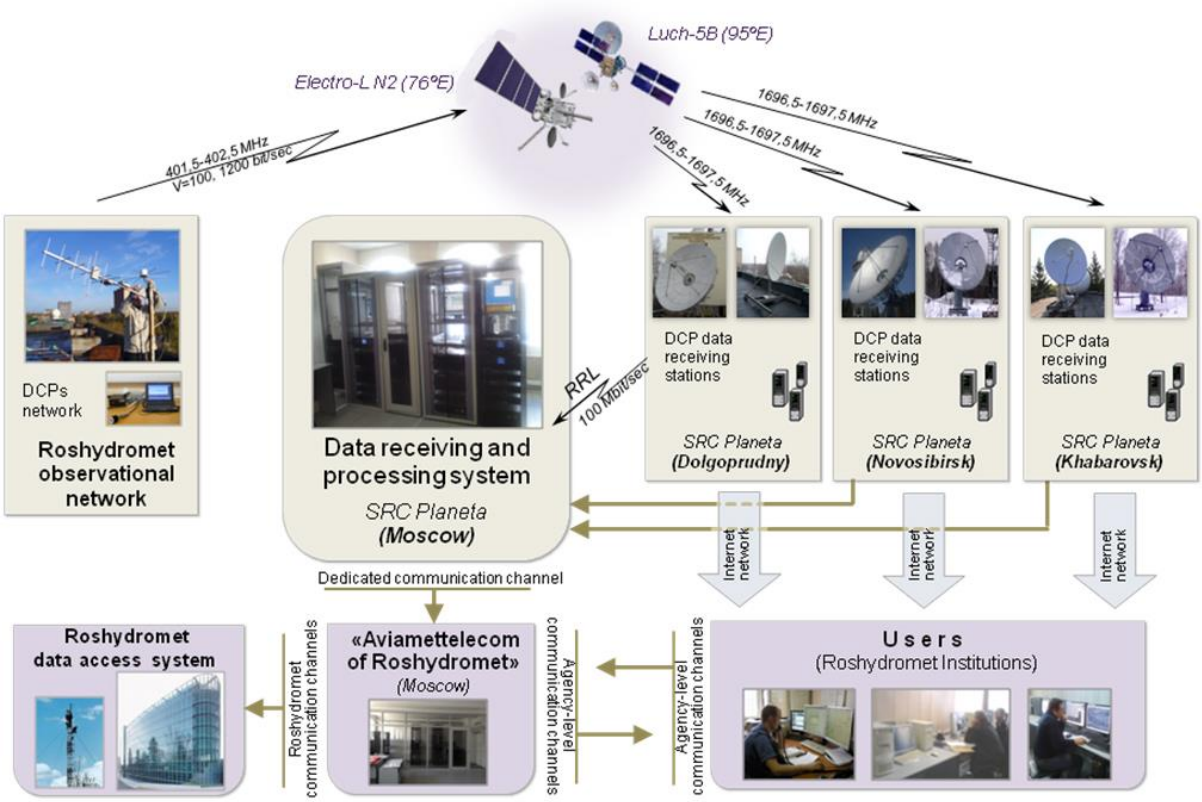

Figure 2: Flowchart of Russian DCS.

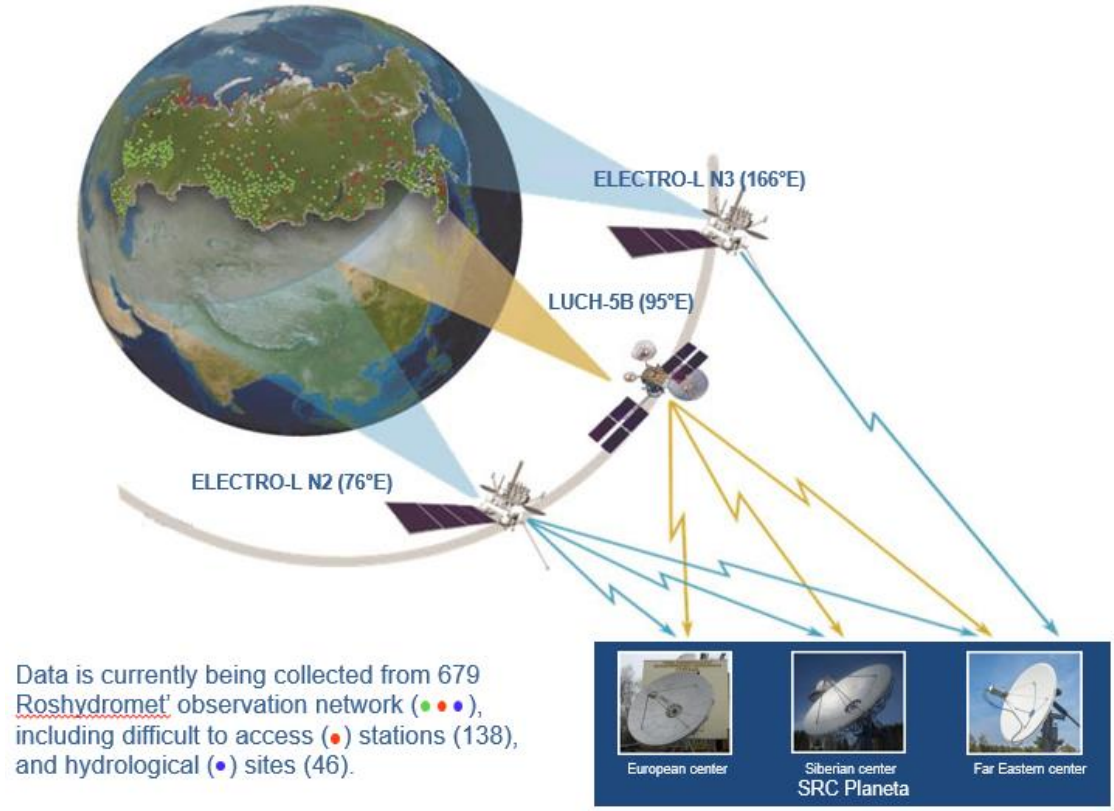

Figure 3: Current status of Russian DCS.

Figure 4: Geographical distribution of DCPs (679 DCPs, May 2020).

3. DEVELOPMENT PERSPECTIVES

Electro-L N3 (166º E) was launched on December 24th, 2019, and currently at the commissioning phase. After the completion of the commissioning phase, the orbital position of Electro-L N3 will be changed. Electro-L N3 will be moved to the position of 76ºE, and Electro-L N2 will take the position of 14.5ºW (Figure 5).

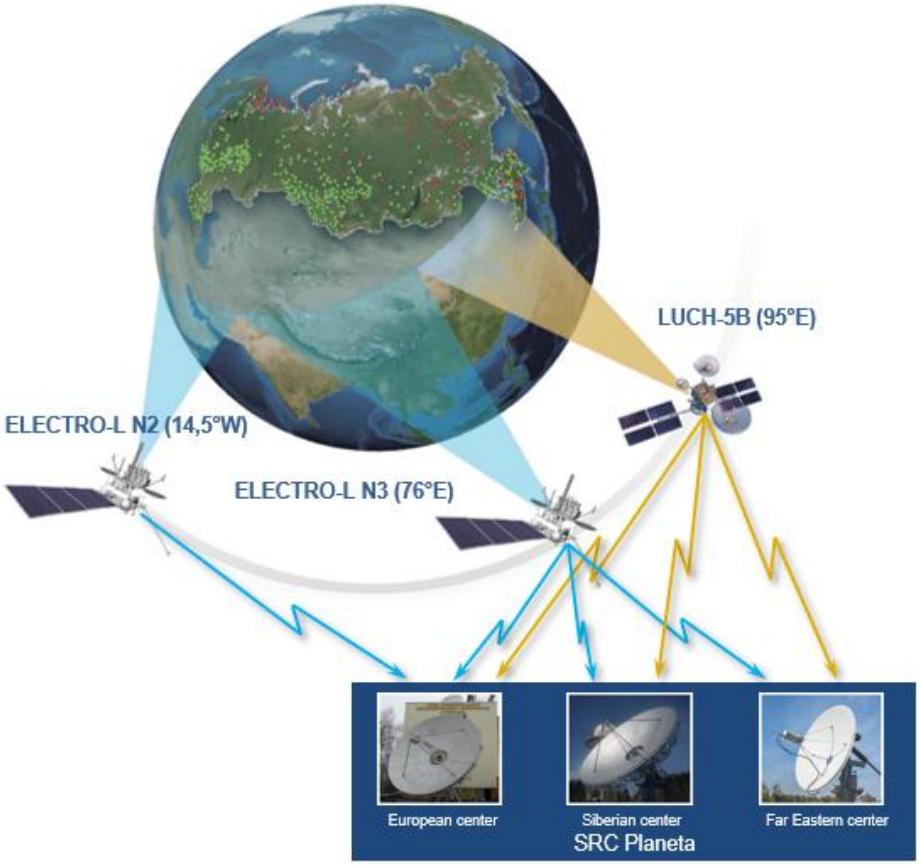

Figure 5: Development perspective of the Russian DCS.