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Application of remote-sensing data in assessment of changes in freshwater ecosystems located downstream from the Zeya dam, Russia

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The Amur-Heilong River, one of the ten largest rivers on Earth, flows in Northeast Asia through Mongolia, China, and Russia. The floodplains of the Amur and its tributaries create the belt of wetlands which provides important habitats for fish and birds.
The large Zeya hydropower dam is located on the Zeya River, the largest left-bank tributary of the Amur-Heilong. The construction of the dam began in 1964 and was completed in 1980. The flow regulation has reduced the magnitude of periodic flooding of the floodplain areas located downstream from the Zeya dam and disrupted habitats.
It is difficult to assess freshwater ecosystems' transformation without using numerical values. This assessment issue further makes it impossible to develop measures necessary to either maintain or restore disrupted freshwater ecosystems. Application of remote sensing methods allows estimating characteristics of the ecosystem's components and analyzing both frequency of the floodplain inundation and changes in the floodplain areas' biomass.
The research aims to identify and analyze the trend and intensity of changes of the floodplain components located downstream from the Zeya dam and exposed to its impact. The methodology involves estimation of spatiotemporal changes of components located downstream from the Zeya dam.
Two sections of a wide floodplain located downstream from the Zeya dam were considered during the analysis. The wide floodplain due to its size serves as a habitat for numerous species of birds, fish and other animals, and is crucial to the freshwater ecosystem's biodiversity. The first section is located in the immediate vicinity of the Zeya dam; its length being 140 km with maximum width of 17 km. The second section begins 350 km away from the dam of Zeya HPP, below the confluence of the Selemdzha River, the Zeya's biggest tributary, and ends in the estuary of the Zeya; the length of the section is 200 km, its maximum width being 23 km.
The retrospective state is represented by archival imageries from missions flown by the CORONA, ARGON, and LANYARD satellite systems, dated September 23, 1969 and September 14, 1971. The archival imageries reflect the state of the area, typical for the Zeya River's natural (unaltered) flow regime. (The Zeya dam hadn't exerted any significant impact on the flow regime before it was launched in 1980.) The modern state is presented by imageries captured by the Sentinel-2 satellite, obtained on September 11, 2016. Two thematic layers are created with a scale of 1:50000.
An analysis of the objects' changes detected at each site was made during the comparison of remote data from 1969/1971 and 2016. A comparison of the identified changes for the two sites was also made, which allowed an evaluation of the transformation of the floodplain objects depending on their proximity to the dam.