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## **Ilimsk Ostrog: its Historical and Dendro-Chronological Aspects**

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*This article focuses on dating the unique monument of wooden architecture from the time of the Russian colonization of Siberia – the Ilimsk stockaded town (the Saviour Tower of the Ilimsk stockaded town and the Ilimsk Kazan church). The monument is studied using dendrochronological analysis. This method is based on variable annual growth of tree-rings, and provides the most objective date with an accuracy of up to a year. The results of investigations confirm traditional dates of construction for the Saviour Tower of the Ilimsk stockaded town and the Ilimsk Kazan church.*

*Keywords: wooden architecture, Siberia, history, architecture, dendrochronology*

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### **Introduction**

Practice of dendro-chronological method for dating of architectural (archeological) objects is almost a century old, counting from the works of its founder – A. Douglass (1919). In Russia, wide-scaled scientific researches in the sphere of historical dendro-chronology were started in 60-s of XX century and were originally connected with the names of B.A. Kolchin and N.B. Chernyh (1977, 1996). The result of their works were dating series of wooden architecture monuments and archeological woods, having been found in the course of excavations of ancient sites in the northern-western part of European Russia. Notwithstanding a significant potential

in the form of wooden architecture monuments and two large dendro-chronological centers (in Yekaterinburg and Krasnoyarsk), the Asian part of Russia is rather poorly researched in the sphere of historical dendro-chronology (Shijatov, 1980; Shijatov, Hantemirov, 2000; Myglan 2005, 2006). The given situation is caused by that, that problematics of researches of the existing laboratories is first of all connected with bio-indication of natural and technogenic processes, with a reconstruction of past climatic changes, fire dynamics and so on. It has a certain meaning that monuments are difficult to be reached, construction material collection is difficult to be realized, and it is necessary to build tree-ring

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scales for the period of 400-450 years, and that is rather labor-consuming for the main part of the territories.

In the given article we address to such unique monuments of Siberian wooden architecture, as the Spassky Tower of Ilimsk Ostrog and Ilimsk Church of the Kazan Icon of the Mother of God and consider questions, which are connected to dendro-chronological dating and correlation of the received data with historical events.

### Materials and methods

We have formed a net of tree-ring chronologies (TRC) in the direction from south to north in the intervals from 50 to 80 km. from each other, in order to make dating of the wooden architecture monuments by the growing trees in the Bratsk and Ust-Ilimsk regions (Fig. 1). We have taken more than 20 common pine samples (*Pinus sylvestris* L) from every indicator area. Except plot pl\_1 (a protected site of the piny wood, being adjacent to the museum «Angarsk Village»), other sampling areas are situated in a 300-meter zone near by the road, as far as the forest area has been cut over farther from the road. The main difficulty on the given stage of our research has been in the following: to find rather old trees – 400 – 450 years old, i.e. with formed TRCs, suitable for XVII century monuments dating.

The realized standard complex of works, which has involved growing trees core treatment, has let us acquire generalized TRCs, being from 300 to 449 years length for every plot (Table. 1). As it has been presupposed, in the researched region, tree increment is characterized by a low climatic changeability (rings are wide and scarcely changing from year to year), and it can be easily seen from the values of standard deviation and sensitivity coefficient. Value analysis of the inter-series correlation coefficient has proved that tree increments are strongly connected

with each other and synchronically reflect the influence of all the complex of natural climatic factors at all the analyzed plots. Speaking about cross-dating, it has given an opportunity to use the longest TRCs for dating the monuments from the regions, for which short tree-ring rows have been made.

In the given case, being mostly close to Ilimsk Ostrog (Fig. 1), the length and the quality of the chronological data has turned out to be not enough for a reliable cross-dating of the monuments of the third quarter of XVII century. The way out of the given situation has been found to apply 449 years old chronology of plot pl\_1. Moreover, at present time, the appliance of this very TRC has allowed dating of the Bratsk Ostrog Tower (2008), and as a consequence, we have managed to prolong and to improve the quality of its replication for XVI-XVII centuries by means of additional material usage. There has been calculated correlation coefficients (Pirson's coefficient) for the last 300 years and chronologies of other plots in order to find out whether a new 495 years old chronology (Ang) is suitable for the Ilimsk Ostrog dating. The acquired results have proved that it is much more strongly connected with plot pl\_10 ( $r=0.60$ ), and it allows using Ang tree-ring chronology for dating samples from the Spassky Tower of Ilimsk Ostrog and Ilimsk Kazan Church.

They have used boring tools to take samples from the dead-wood, in order to select samples from the wooden architecture monuments. Appliance of such devices has allowed minimizing the damage, being inflicted to the objects of research, and as a consequence, there has appeared a possibility to take as many samples as it is needed from any necessary part of the construction, i.e. to select a sample from any chosen part of the log, still retaining its sub-bark ring or containing maximal possible number of rings. Appliance of the new method of samples selection has allowed gathering and acquiring

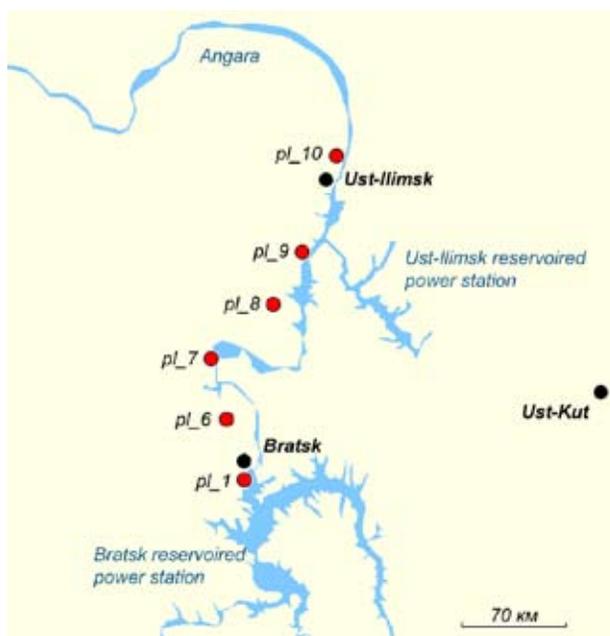


Fig. 1. The location of the indicating areas

Table 1. The characteristics of standardized TRC.

Chronology	Period (year)		Inter-serial correlation coefficient	m	σ
	Start	End			
Pl_1	1560	2008	0,57	0,14	0,17
Pl_6	1677	2008	0,63	0,12	0,14
Pl_7	1709	2008	0,62	0,12	0,13
Pl_8	1673	2008	0,53	0,12	0,15
Pl_9	1623	2008	0,66	0,15	0,19
Pl_10	1635	2008	0,62	0,13	0,15

Note: m – sensitivity coefficient; σ – standard deviation, coefficients significant at  $p < 0.05$ .

generalized TCRs of rather high quality from the researched monuments. All in all, we have selected 12 samples from the Spassky Tower of Ilimsk Ostrog according to the cardinal directions (Fig. 2): the eastern side of the construction – we have collected the following samples: d\_1, d\_2 (6-th, 7-th timber sets, southern separation partition), d\_6 (6-th timber set, northern separation partition); its southern side – d\_3, d\_4 (6-th, 7-th timber sets); its western side – d\_5 (7-th timber set, southern separation partition), d\_12 (7-th timber set); its northern side – d\_7, d\_8, d\_9, d\_10, d\_11 (12-th, 7-th, 6-th, 7-th, 6-th

timber sets). We have selected 12 samples from Ilimsk Kazan Church (Fig. 3). The southern side of the construction – e\_1, e\_2, e\_3, e\_4, e\_6, e\_7, e\_8 (1-th, 2-th, 6-th, 8-th, 7-th, 3-th, 8-th timber sets); its eastern side – e\_9 (5-th timber set); its northern side – e\_10, e\_11, e\_12, e\_5 (5-th, 4-th, 3-th, 1-th timber sets). Speaking about the condition of the researched objects, we should mark poor integrity of the logs surfaces from the front side of the construction (because of mechanic, atmospheric and other impacts), and in some cases we have not managed to select cores of satisfactory quality from some logs.



Fig. 2. The Spassky Tower of Ilimsk Ostrog, the Architectural-ethnographic museum «Taltsy» 2008



Fig. 3. The Ilimsk Church of the Kazan Icon of the Mother of God, the Architectural-ethnographic museum «Taltsy» 2008

Measuring of annual rings width was performed by means of semiautomatic apparatus «LINTAB» (accurate to 0.01 mm). Dating of the measured series has been made by means of combination of graphic cross dating (Douglass, 1919) and cross-correlation analysis (with the help of a suit of specialized programs for dendro-chronological researches – DPL (Holms, 1984) and «TSAP V3.5» (Rinn, 1996)).

### **The Basic Part**

According to F.G. Miller, the first wintering place by the Ilim River was at the entry of the Idirma River and it was built by the detachment of foreman Vasiliy Bugor in 1628. In 1630 the squadron of hetman Ivan Galkin was sent to the Ilim River. From the Tungus Ivan Galkin learnt about an easier way from Ilim to the Lena River and built a new fur-tributing wintering place, which was called «a wintering place by the Ilim River at the Lenskiy portage». Construction of this portage was the main reason of fast development of the Ilimsk wintering place, which made the Idirma entry wintering place take a back seat. And already in 1631 foreman Firs Nikiforov was gathering fur tributes not from the Idirma entry, but from the Ilimsk wintering place (Miller, 2005. P. 51-52, 54).

In 1647 the Ilimsk wintering place was rebuilt into an ostrog, which became a center of independent Ilimsk voivodeship in 1649 (Sherstoboev, 2001. V. 1. P. 43-44). In the first voivode Timofey Shusherin's days, they made a description of Ilimsk Ostrog: those days it consisted of two towers and ostrog walls, containing some constructions inside. Though in 1666, the Ostrog was destroyed by fire in the days of Tobolsk boyar's son Aleksey Rastorguev, who was temporally appointed as its voivode. Having arrived to the place of his service, new voivode Sila Onichkov wrote to the tsar: «I, your servant, have arrived to Ilimsk, to the ruined Ilimsk site».

Having faced the necessity to build a new ostrog, the voivode refused from the previous site, which he thought to be inconvenient: «the place is cramped between high stone rocky mountains, being impossible to ride on» (Sherstoboev, 2001. V. 1. P. 44). A new site for the future fortress was chosen one and half kilometers downstream the Ilim River. 21 July, 1667, that day a year after the fire, having made his estimations and organized the winter lumbering, voivode Onichkov «outlined the ostrog place and established the first Spassky Major Tower right that day» (Sherstoboev, 2001. V. 1. P. 47). We should note that, precisely this very tower has been preserved up to our days.

Already in 1669 the voivode moved to the newly re-build Ostrog, which presented a wooden fortress of eight towers, including three gate towers and walls, made of standing posts, of total length 319 sagenes. Inside the ostrog they built the Church of the Icon of Christ not Made by Hands, voivode's mansion house, the house for serving people, and a fur barn. Nikita Lazarev, a copyist of the house for serving people, was made responsible for the construction of the Ostrog and 6 August 1668 he prepared and sent a plan (drawings) of the Ostrog to Moscow (Sherstoboev, 2001. V. 1. P. 47).

After 1669 Ilimsk Ostrog was not once repaired and rebuilt. It is also known that the Ostrog was finished building in 1687-1688 and, as a consequence, the length of its walls reached 333 sagenes. In 1694 the result of reconstruction works was the following: «And the length of the new Ostrog vs. the old one is as many as 333 sagenes... and the towers of the Ostrog are still the same, and we have not added any new towers or diminished, and have exchanged or repaired none of them, just have re-lagged them on» (Sherstoboev, 2001. V. 1. P. 48, 49). The last reconstruction of Ilimsk Ostrog was done in the days of voivode Ivan Popov, in 1753-1755, and it was the following: «they built a camp poling

around the town» and re-berthed the towers, (Sherstoboev, 2001. V. 2. V. 16). Since that time, the Ostrog constructions have been only gradually and steadily destroyed by time.

Speaking about the history of the Ilimsk Kazan Church, we should mark that today it is the oldest church, which has survived in Eastern Siberia. According to clerical records, it was built in 1679 by Ilimsk Cathedral Priest Peter Maximov. And this very date is usually mentioned in the historical literature. At the same time, there is a supposition, which has not been documentarily proved, that the Church was erected earlier – in 1667. (Nefedyeva, 2000. P. 64-66).

The Ilimsk Kazan Church was possibly built by the order of the voivode, as far as they made a special voivode's place in the Cathedral. The church was constructed outside the Ostrog wall, near by the Spassky Tower: «downwards, to the left side from the Spassky Gate Tower» (Sherstoboev, 2001. V. 1. P. 56). It is supposed that initially the Kazan Church presented by itself a small cage construction, decorated by the barrel covering with wide politsas (a lower, low-pitched part of a steep gable or hint roof in the Russian wooden architecture) on the log base. The barrel and its crowning small cupola were covered with lay. Later, from the western side of the Church there was built a low and wide wooden additional construction, covered by the low-pitched gable roof. Thereat, the temple itself was situated in this additional construction, while its original part, overtopping the temple, was turned into the altar. In the second part of XIX century the front part of the walls of the Ilimsk Kazan Church was boxed-off with even boards. And this way we see it in the survived pictures of the beginning XX century. (Kalinina, 2000. P. 258-260). Speaking about the Kazan Church, architecture A.V. Opolovnikov marked, that it was «not once rebuilt, but the carcass of its central part has been preserved without changes. And it is exactly the

carcass which is of the main interest of ours: its log structure is gradually broadening so, that the measuring point of the low-pitched elegant poval (a widened upper part of the log structure) is descended down approximately to two thirds of its height. This remarkable constructive peculiarity is very rare nowadays and it makes the Siberian construction relative to the most ancient monuments of Russia» (Opolovnikov, 1989. P. 317).

In 1969-1970, getting into an inundation area because of the Ilimsk Hydro-Electric Power Station construction, the Spassky Tower of Ilimsk Ostrog and the Ilimsk Kazan Church were moved near Irkutsk, into the newly-established museum under the open sky (today, it is the Architectural-ethnographic museum «Taltsy»), where they still exist to the present day. In the course of restoration of the Kazan Church (author of the restoration project G.G. Oranskaya), it has been regained its estimated original image of XVII century.

Within the frames of dendro-chronological part of our research, the samples from the Spassky Tower of Ilimsk Ostrog and the Ilimsk Kazan Church have been gathered, measured and the series of individual increment of each monument have been dated between each other. According to historical data, the dates of the researched objects construction fall approximately at one and the same period, and taking that into account, we have done an intercross dating of individual increment series of these monuments (Fig.. 4).

The intercross dating results have proved that the analyzed series are well correlated between each other. Thus, almost all the samples of the Ilimsk Kazan Church reveal a sharp fall of the increment in 1611-1612, and the same tendency is observed while analyzing the samples from the Spassky Tower. Moreover, all the samples are observed a synchronic increment fall in 1568-69, 1588-1589 and 1637.

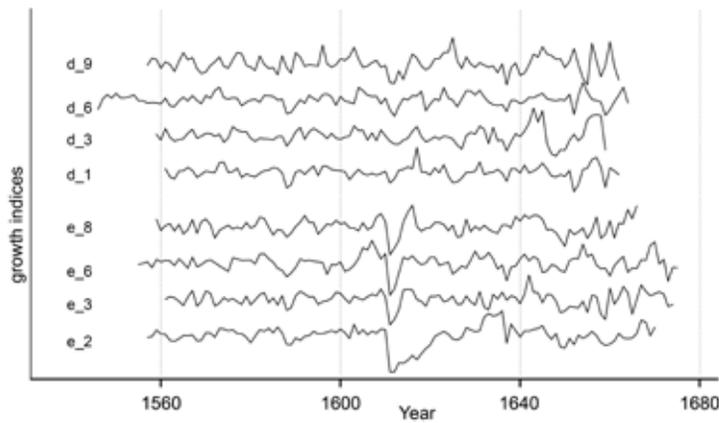


Fig. 4. Results of cross-dating samples for the Spassky Tower of Ilimsk Ostrog and the Ilimsk Church of the Kazan Icon of the Mother of God

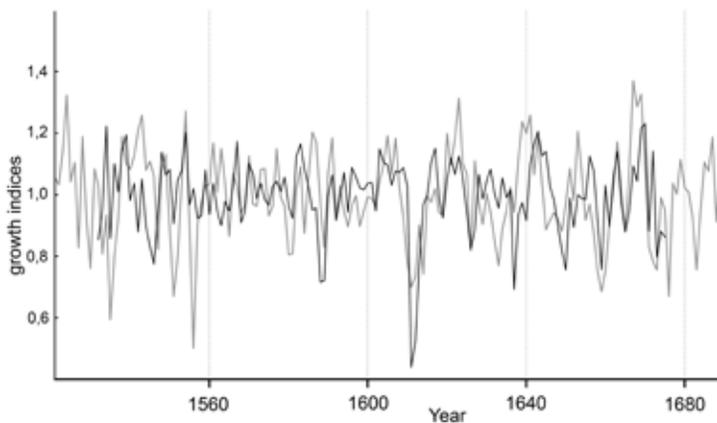


Fig. 5. The cross dating of generalized tree-ring chronology for the Spassky Tower of Ilimsk Ostrog and Ilimsk Church of the Kazan Icon of the Mother of God (black line) with a generalized tree-ring chronology from Ang (grey line)

In order to make an absolute dating of the Spassky Tower of Ilimsk Ostrog and the Ilimsk Kazan Church according to a standard method, we have built a generalized TRC, which have been dated with the help of Ang chronology, being absolutely tied to time scale (Fig. 5).

In the given picture, the increment synchronic change is well seen on all the analyzed section. Correlation coefficient (Pearson's coefficient) between the dated series amounts 0.41 for the period of 144 years. The results of the performed intercross dating of individual increment series are given in Table. 2. Thus, according to

dendro-chronological data, the period of the last peripheral ring formation of the Spassky Tower fell at 1665, and the Kazan Church- at 1675.

### Results and discussions

Comparison of dendro-chronological and historical information reveals a several years' discrepancy in the dating of construction of these monuments. Thus, according to dendro-chronological data, the last peripheral ring of the samples from the Spassky Tower was formed in 1665, and according to historical documents, the Ostrog was destroyed in 1666, and the building of

Table 2. Results of cross-dating samples for the the Spassky Tower of Ilimsk Ostrog and Ilimsk Church of the Kazan Icon of the Mother of God.

Sample's number	Sample's name	Ring (year)		Correlation coefficient	M	$\sigma$	Comment
		central	peripheral				
1	d_01	1561	1662	0,69	0,15	0,70	
2	d_02	1513	1646	0,38	0,16	0,94	
3	d_03	1559	1659	0,63	0,17	0,69	
4	d_05	1553	1662	0,36	0,16	0,43	
5	d_06	1546	1664	0,55	0,15	0,74	
6	d_07	1580	1662	0,33	0,15	0,43	
7	d_08	1542	1665	0,31	0,19	0,40	
8	d_09	1557	1662	0,44	0,23	0,67	
9	e_02	1557	1670	0,63	0,16	0,49	
10	e_03	1561	1674	0,60	0,20	0,67	
11	e_04	1554	1669	0,53	0,23	0,47	
12	e_05	1559	1670	0,48	0,18	0,47	
13	e_06	1555	1675	0,59	0,18	0,37	
14	e_07	1550	1671	0,52	0,22	0,87	
15	e_08	1559	1666	0,56	0,20	0,72	
16	e_09	1567	1668	0,42	0,14	0,72	
17	e_10	1532	1663	0,46	0,13	0,76	
18	e_11	1555	1668	0,53	0,15	0,54	

Note: m – sensitivity coefficient;  $\sigma$  – standard deviation, coefficients significant at  $p < 0.05$ .

the new one, including also the Spassky Tower, was going on from 1667 to 1669. Similar situation is observed concerning the Kazan Church, where the last peripheral ring was formed in 1675, and according to historical data the building of the church was already over in 1679. In both cases we see the difference in 4 years. We may suppose a simple explanation of the given discrepancy. Firstly, to date the time of wood harvesting within the accuracy of a year (a season) is possible only in case there are some remnants of cortex on the outer side of the selected borehole samples. Unfortunately, in our case we have not managed to find any borehole sample, being suitable for dating and satisfying this condition. Probably, several rings from the outer side of the construction logs have been lost. Secondly, speaking about the Spassky Tower of the Ostrog, the following situation is quite possible: some part of its logs

could have been used once again, having been taken from some old constructions (for example, samples d\_2, d\_3), and the other part of its logs could have been harvested immediately after the fire, but was used for the Tower construction only after the new voivode had come. So, if we take into consideration all these circumstances, then dendro-chronological and historical data of constructions will coincide.

Thus, the results of dendro-chronological dating confirm the data, being traditionally accepted in the historical sources, concerning the periods of the Spassky Tower of Ilimsk Ostrog and the Ilimsk Kazan Church construction.

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## **Илимский острог: исторический и дендрохронологический аспекты**

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*Статья посвящена теме датирования уникального памятника деревянного зодчества эпохи русской колонизации Сибири – Илимского острога (Спасская башня Илимского острога и Илимская церковь Казанской иконы Божией Матери). Для исследования использован дендрохронологический анализ, позволяющий на основе изменчивости прироста годичных колец деревьев получить наиболее объективные даты с точностью до года. Результаты исследования подтверждают традиционно принятые в исторической литературе даты сооружения Спасской башни Илимского острога и Илимской Казанской церкви.*

*Ключевые слова: памятники деревянного зодчества, Сибирь, история, архитектура, дендрохронология.*

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