



Scientific and technological cooperation through space diplomacy in the organization of turkic states

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Abstract. This article examines the contemporary development of scientific and technological cooperation through space diplomacy within the framework of the Organization of Turkic States (OTS). Particular attention is given to the growing role of space cooperation as an instrument of scientific diplomacy, technological integration, regional security, and innovation-driven development. The study also explores institutional dialogue among national space agencies of member states, joint satellite initiatives, and cooperation in education and human capital development in the space sector.

Keywords: Organization of Turkic States, space diplomacy, scientific cooperation, technological integration, satellite technologies, innovation, regional diplomacy.

Annotatsiya. Ushbu maqolada Turkiy davlatlar tashkiloti doirasida kosmik diplomatiya vositasida shakllanayotgan ilmiy va texnologik hamkorlikning zamonaviy tendensiyalari tahlil qilinadi. Kosmik hamkorlikning ilmiy diplomatiya, texnologik integratsiya, mintaqaviy xavfsizlik va innovatsion taraqqiyotdagi oʻrni ochib beriladi. Shuningdek, TDT doirasida kosmik agentliklar oʻrtasidagi institutsional muloqot, qoʻshma sunʼiy yoʻldosh tashabbuslari va kadrlar tayyorlash masalalari tadqiq etiladi.

Kalit soʻzlar: Turkiy davlatlar tashkiloti, kosmik diplomatiya, ilmiy hamkorlik, texnologik integratsiya, sunʼiy yoʻldosh texnologiyalari, innovatsiya, mintaqaviy diplomatiya.

Аннотация. В статье анализируются современные тенденции научно-технологического сотрудничества посредством космической дипломатии в рамках Организации тюркских государств. Особое внимание уделяется роли космического сотрудничества как инструмента научной дипломатии, технологической интеграции, региональной безопасности и инновационного развития.

Ключевые слова: Организация тюркских государств, космическая дипломатия, научное сотрудничество, технологическая интеграция, спутниковые технологии, инновации.

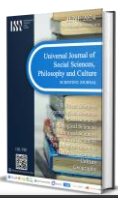
Introduction

In the twenty-first century, outer space has become not only a field of scientific exploration but also an increasingly important domain of international diplomacy, strategic cooperation, and geopolitical competition. Space technologies today influence national security, telecommunications, climate monitoring, agriculture, disaster management, and digital governance. As a result, space cooperation has gradually evolved into a significant component of foreign policy and international partnership.

Within this context, the Organization of Turkic States is expanding its agenda beyond traditional political, economic, and cultural cooperation by incorporating scientific and technological collaboration into its strategic framework. Among these emerging directions, space diplomacy is becoming one of the most promising areas of integration among Turkic states.

The increasing institutional dialogue among national space agencies of Azerbaijan, Kazakhstan, Kyrgyzstan, Türkiye, and Uzbekistan demonstrates that space cooperation is no longer limited to technical exchange. It is transforming into a strategic platform for regional innovation, knowledge sharing, scientific diplomacy, and coordinated technological development.

Literature Review



Academic scholarship increasingly conceptualizes space diplomacy as an emerging field situated at the intersection of international relations, science diplomacy, technological governance, and strategic cooperation. Contemporary studies interpret outer space not merely as a technological domain, but as a political and diplomatic arena where states pursue national interests while simultaneously developing cooperative mechanisms for peaceful exploration, satellite governance, and knowledge exchange. Space diplomacy is therefore increasingly viewed as a tool of international dialogue, innovation partnership, and regional integration.

Scholars such as Joseph Nye associate scientific and technological cooperation with the broader concept of soft power, emphasizing that innovation, scientific exchange, and technological capability contribute directly to a state's international influence and global reputation. In this context, joint space initiatives function not only as technical projects but also as instruments of trust-building, strategic communication, and international legitimacy.

Research on the Organization of Turkic States has traditionally concentrated on political dialogue, cultural diplomacy, transport corridors, economic integration, and common historical identity. Earlier academic literature focused primarily on linguistic and civilizational unity among Turkic nations, as well as on institutional development after the transformation of the Turkic Council into the Organization of Turkic States in 2021. However, more recent analytical studies reveal that the agenda of the OTS is expanding beyond traditional cooperation toward innovation-driven integration, where science, digital transformation, and high technology are acquiring strategic significance.

In this evolving framework, space diplomacy is emerging as a new pillar of Turkic cooperation. Official OTS policy documents, summit declarations, and reports of meetings among the heads of national space agencies indicate growing attention to joint satellite technologies, aerospace research, digital infrastructure, data exchange, and educational cooperation in the space sector. Recent institutional initiatives including inter-agency consultations, regional space meetings, and proposals for joint technological platforms demonstrate that the Turkic states increasingly perceive outer space as an area of collective strategic interest.

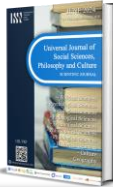
A particularly important dimension of this process is the growing role of Uzbekistan under the leadership of President Shavkat Mirziyoyev. Since 2016, Uzbekistan's foreign policy modernization and its active engagement in Turkic regional cooperation have significantly contributed to expanding the scientific and technological agenda within the OTS. Presidential speeches, strategic policy documents, and state reform programs increasingly frame innovation, digitalization, and space technologies as essential elements of national development and regional partnership.

A particularly relevant presidential statement for the present study was delivered during the presentation on expanding the use of space monitoring technologies in Uzbekistan, where the President emphasized: "The main goal is to use satellite analysis to identify opportunities that can stimulate economic growth."

This statement reflects Uzbekistan's evolving national approach toward the strategic use of space technologies in economic planning and state governance. It also demonstrates that space-related initiatives are no longer perceived solely as scientific experiments but as practical policy instruments connected to economic development, resource management, digital transformation, and regional modernization.

Another important dimension of President Mirziyoyev's recent speeches is the emphasis on innovation and artificial intelligence as part of Uzbekistan's long-term technological strategy. In addressing future development priorities, he underlined that modern development increasingly depends on technological transformation across all sectors, including the space industry. These policy directions strengthen Uzbekistan's contribution to regional scientific diplomacy within the OTS and position the country as one of the active participants in building a common Turkic innovation space.

Thus, the literature suggests that space diplomacy in the Turkic world should be analyzed not only through the lens of scientific cooperation but also as a multidimensional phenomenon combining diplomacy, innovation policy, strategic governance, regional integration, and technological sovereignty. Within this broader framework, Uzbekistan's policy initiatives and the strategic vision



articulated in presidential discourse provide an important intellectual and political foundation for the institutionalization of space cooperation within the Organization of Turkic States.

Research Methodology

This study applies a qualitative research methodology based on comparative political analysis, institutional analysis, and document review.

The research is based on:

- official documents of the Organization of Turkic States;
- reports of national space agencies of member states;
- summit declarations and memoranda related to space activities;
- analytical materials on regional diplomacy and scientific cooperation;
- comparative review of recent developments in Turkic regional integration.

The methodological approach allows the analysis of space diplomacy both as a technological cooperation mechanism and as a diplomatic instrument of regional integration.

Analysis and Results

The analysis shows that space diplomacy within the Organization of Turkic States (OTS) has evolved into one of the most dynamic and strategically important areas of regional cooperation in recent years. What initially appeared as a narrow technical dialogue among national space institutions is now gradually transforming into a broader platform of scientific partnership, technological modernization, institutional coordination, and geopolitical cooperation among Turkic states.

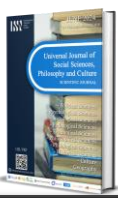
The strengthening of this agenda can be clearly observed through recent institutional developments within the Organization of Turkic States. A significant milestone was the regular organization of meetings among the heads of space agencies and relevant institutions of member states. These meetings demonstrate a growing political commitment to establishing long-term cooperation in satellite technologies, Earth observation systems, aerospace education, digital infrastructure, and innovation policy. In particular, the latest consultations among the national space agencies of Türkiye, Kazakhstan, Azerbaijan, Uzbekistan, and Kyrgyzstan confirmed the intention to deepen institutional dialogue and promote practical mechanisms of joint technological cooperation.

One of the most important findings of the research is that national space capacities are increasingly being transformed into regional cooperative platforms. Member states of the OTS already possess different but complementary technological resources in the space sector. Türkiye has developed advanced satellite communication and aerospace engineering capabilities through programs such as TÜRKSAT. Kazakhstan possesses significant space infrastructure through Baikonur and national satellite systems such as KazSat. Azerbaijan has strengthened its international position through Azerspace and Azercosmos. Uzbekistan, in recent years, has accelerated the development of digital transformation and remote sensing technologies linked to agriculture, resource management, and environmental monitoring. These diverse capacities create a favorable institutional basis for technological complementarity and regional cooperation.

Another important result is that space diplomacy within the Turkic world increasingly performs several interconnected strategic functions.

The first major dimension is scientific cooperation. Space diplomacy creates opportunities for joint research in satellite engineering, aerospace science, Earth observation, climate technologies, and geospatial analytics. Cooperation between universities, innovation centers, engineering institutions, and national space agencies contributes to the creation of a common scientific ecosystem within the Turkic world. Academic exchange, joint laboratories, scientific conferences, and regional educational initiatives support knowledge transfer and strengthen scientific capacity across member states. This process is particularly important because it allows Turkic states not only to consume foreign technologies but also to participate in knowledge production and innovation development. The increasing cooperation among researchers and technical specialists contributes to the formation of a new regional scientific network.

The second important area is technological integration. Satellite communication systems, digital mapping, remote sensing, geospatial data processing, aerospace engineering, and navigation



technologies are becoming important drivers of innovation-led growth across the Turkic region. Satellite technologies now play an important role in agriculture, urban planning, water resource monitoring, logistics, meteorology, mineral exploration, and climate observation. For countries such as Uzbekistan, which are implementing large-scale digital reforms, space technologies are becoming an instrument of economic modernization and sustainable development. The growing exchange of satellite data and digital infrastructure between member states opens the possibility of creating a common technological space based on shared innovation systems. This contributes to reducing technological dependence and strengthening regional technological sovereignty.

The third strategic direction is regional security. Modern space technologies increasingly serve as tools for ensuring environmental security, disaster prevention, border monitoring, and strategic communication. Earth observation satellites provide critical information for early warning systems related to droughts, floods, desertification, ecological degradation, and natural disasters. Space-based monitoring systems can also support border observation, resource management, and infrastructure security. In this regard, space diplomacy becomes closely connected to broader regional security architecture. For the Turkic region characterized by shared geography, ecological challenges, transport interdependence, and strategic transit routes space technologies provide practical instruments for collective monitoring and coordinated response. This expands the meaning of diplomacy from political consultation toward operational cooperation in security-related fields.

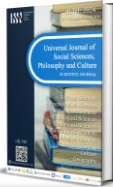
The fourth major direction is human capital development. One of the most promising outcomes of OTS space cooperation is the growing investment in education, youth engagement, and scientific training. Recent initiatives such as youth space academies, academic exchange programs, regional engineering workshops, and cooperation between technical universities show that space diplomacy is contributing to the emergence of a new generation of specialists in aerospace engineering, digital technologies, artificial intelligence, robotics, and satellite systems. For the long-term future of Turkic integration, this dimension is particularly significant. Sustainable regional cooperation depends not only on institutions and political agreements but also on qualified human capital capable of maintaining innovation systems and generating new technologies.

The analysis also demonstrates the increasingly active role of Uzbekistan in shaping this agenda. Since 2016, Uzbekistan's foreign policy modernization has expanded the country's participation in regional scientific and technological diplomacy. Under the leadership of President Shavkat Mirziyoyev, innovation, digitalization, and technological modernization have become central priorities of national development. Uzbekistan's efforts in applying space technologies to agriculture, environmental monitoring, water management, land resources, and economic planning demonstrate that the country increasingly treats space not only as a technological sector but as a strategic instrument of governance and development. This national experience strengthens Uzbekistan's position within the OTS and increases its contribution to the broader process of Turkic technological integration.

The research confirms that space diplomacy within the OTS is gradually transforming Turkic cooperation from a framework historically centered on common identity, language, and cultural heritage into a more practical model of scientific-technological partnership. Space diplomacy in the Turkic world is no longer symbolic. It is becoming a functional mechanism of regional integration that combines diplomacy, innovation, security, economic modernization, and scientific cooperation. Its long-term strategic value lies in the fact that it creates a new institutional space where common identity is translated into concrete technological collaboration and sustainable regional development. Thus, space diplomacy is emerging as one of the most перспективных strategic instruments for strengthening the international position, technological competitiveness, and institutional cohesion of the Organization of Turkic States in the twenty-first century.

Conclusion

In conclusion, space diplomacy is emerging as a new strategic dimension of cooperation within the Organization of Turkic States. It combines scientific diplomacy, innovation policy, regional security, and technological development into a unified framework of cooperation. The study demonstrates that space cooperation has the potential to become one of the most dynamic areas of



Turkic integration in the coming decade. The future of Turkic integration will increasingly depend not only on historical and cultural ties, but also on scientific capacity, technological innovation, and strategic cooperation in emerging sectors such as outer space.

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