Geosistemy perehodnykh zon = Geosystems of Transition Zones / Геосистемы переходных зон

Content is available under the Creative Commons Attribution 4.0 International License (CC BY 4.0)

2024, vol. 8, No. 4, pp. 298–312

URL: http://journal.imgg.ru/archive.htm ; https://elibrary.ru/title_about.asp?id=64191

https://doi.org/10.30730/gtrz.2024.8.4.298-312; https://www.elibrary.ru/gutfzv

Tectonic movements and deformations within the Bishkek local GPS network (Northern Tien Shan) based on long-term space geodetic observations

@Kuzikov, Sergey I. (https://orcid.org/0000-0002-7300-0314), ksi@gdirc.ru

Prokhorov, Oleg A. (https://orcid.org/0000-0001-9408-453X), helgpro@yandex.ru

Research Station of the Russian Academy of Sciences in Bishkek, Bishkek city, Kyrgyzstan

Abstract PDF ENG PDF RUS Full text PDF RUS

Abstract. The velocity field of modern crustal movements within the Bishkek local GPS network (the Northern Tien Shan) was studied for the years 1997–2021 of repeated space geodetic measurements. A regular decrease in the northern velocity component was shown from the southern block of Paleozoic rocks on the northern slope of the Kyrgyz Ala-Too Range through the middle block of Cenozoic formations and to the northern block of Quaternary deposits in the Chu Valley. Based on the velocity vectors, fields of different types of strain rates were constructed, which indicate a concentration of increased strain values up to $1.4 \cdot 10^{-7}$/year within the middle Cenozoic block. Moreover, the high strain rate is not concentrated in fault zones and is dispersed over the area of the Cenozoic tectonic block, which is located at the junction of the northern spurs of the Kyrgyz Range and the Chu depression.

Keywords:

Northern Tien Shan, GNSS measurements, modern movements,

deformations, geological structure

For citation: Kuzikov S.I., Prokhorov O.A. Tectonic movements and deformations within the Bishkek local GPS network (Northern Tien Shan) based on long-term space geodetic observations. Geosistemy perehodnykh zon = Geosystems of Transition Zones, 2024, vol. 8, No. 4, pp. 298–312. (In Russ., abstr. in Engl.). https://doi.org/10.30730/gtrz.2024.8.4.298-312; https://www.elibrary.ru/gutfzv

Для цитирования: Кузиков С.И., Прохоров О.А. Тектонические движения и деформации в пределах Бишкекской локальной GPS-сети (Северный Тянь-Шань) по данным многолетних космогеодезических наблюдений. Геосистемы переходных зон, 2024, т. 8, № 4, с. 298–312. https://doi.org/10.30730/gtrz.2024.8.4.298-312; https://www.elibrary.ru/gutfzv

References

1. Molnar P., Tapponnier P. **1975.** Cenozoic tectonics of Asia: effects of a continental collision. *Science*, 189(4201): 419–426.
2. Abdrakhmatov K.Ye., Aldazhanov S.A., Hager B.H., Hamburger M.W., Herring T.A., Kalabaevll K.B., Makarov V.I., Molnar P., Panasyuk S.V., Prilepin M.T. et al. **1996.** Relatively construction of the Tien Shan inferred from GPS measurements of present-day crustal deformation rates. *Letters to Nature*, 384: 450–453.
3. Zubovich A.V., Wang X.-Q., Scherba Y.G., Schelochkov G.G., Reilinger R., Reigber C., Mosienko O.I., Molnar P., Michajljow W., Makarov V.I., et al. **2010.** GPS velocity field for the Tien Shan and surrounding regions. *Tectonics*, 29(TC6014). https://doi.org/10.1029/2010TC002772
4. Ischuk A., Bendick R., Rybin A., Molnar P., Khan S., Kuzikov S., Mohadjer S., Saydullaev U., Ilyasova Z., Schelochkov G. et al. **2013.** Kinematics of the Pamir and Hindu Kush regions from GPS geodesy. *Journal of Geophysical Research: Solid Earth*, 118: 2408–2416. https://doi.org/10.1002/jgrb.50185
5. Kuzikov S.I. **2019.** The ratio of tectonic structure and modern movements of the crust in area of geodynamic proving ground in Bishkek. *IOP Conference Series: Earth and Environmental Science*, 324(012011). https://doi.org/10.1088/1755-1315/324/1/012011
6. Replumaz A., Tapponnier P. **2003.** Reconstruction of the deformed collision zone between India and Asia by backward motion of lithospheric blocks. *Journal of Geophysical Research*, 108(2285). https://doi.org/10.1029/2001JB000661
7. Flesch L.M., Haines A.J., Holt W.E. **2001.** Dynamics of the India-Eurasia collision zone. *Journal of Geophysical Research*, 106: 16435–16460.
8. Kuzikov S.I., Mukhamediev S.A. **2010.** Structure of the present-day velocity field of the crust in the area of the Central-Asian GPS network. *Izvestiya, Physics of the Solid Earth*, 46(7): 584–601. https://doi.org/10.1134/S1069351310070037
9. Kuzikov S.I. **2014.** Methodical questions and accuracy problems of GPS observations by the example of the geodynamic proving ground in Bishkek. *Izvestiya, Physics of the Solid Earth*, 50(6): 770–784. https://doi.org/10.1134/S1069351314060032
10. Herring T.A., King R.W., Floyd M.A., McClusky S.C. **2010.** *Introduction to GAMIT/GLOBK: Release 10.7*. Technical report. Massachusetts Institute of Technology, 54 p. URL: http://geoweb.mit.edu/gg/Intro_GG.pdf (дата обращения 10.09.20).

11. Kuzikov S., Kenigsberg D.V., Salamatina Yu., Prokhorov O.A. **2023.** Comparison of methods for computing highly accurate daily GNSS positions. *Civil Engineering Journal*, 9(02): 305–318. https://doi.org/10.28991/CEJ-2023-09-02-04
12. Shen Z.K., Jackson D.D. **1996.** Crustal deformation across and be yond the Los Angeles Basin from geodetic measurements. *Journal of Geophysical Research*, 101(B12): 27957–27980. https://doi.org/10.1029/96jb02544
13. Shen Z.K., Jackson D.D. **2015.** Optimal interpolation of spatially discretized geodetic data. *Bulletin of the Seismological Society of America*, 105(4): 2117–2127. https://doi.org/10.1785/0120140247
14. Sedov L.I. **1970.** [*Continuum mechanics*]. Book 1. Moscow: Nauka, 492 p. (In Russ.).
15. Kargin V.R., Kargin B.V. **2015.** *Continuum mechanics.* Part 1. Samara: SSAU Publ. House, 76 p. (In Russ.).
16. Kostyuk A.D., Sagiya T., Zubovich A.V. **2006.** Comparison of seismicity distribution and deformation field. *Vestnik Kyrgyzsko-Rossiyskogo Slavyanskogo universiteta*, 6(3): 64–70. (In Russ.).
17. Sycheva N.A., Mansurov A.N. **2017.** Comparison of crustal deformation rates estimated from seismic and GPS data on the Bishkek geodynamic polygon. *Geodynamics & Tectonophysics*, 8(4): 809–825. (In Russ.). https://doi.org/10.5800/gt-2017-8-4-0318