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Scientific Technical Report STR14/11

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# **Report on the shallow geology investigation in Bishkek (Kyrgyzstan)**

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**Report on the shallow geology investigation in Bishkek (Kyrgyzstan)**  
**S. Parolai, B. Moldobekov, A. Meleshko, M. Pilz, S. Ullah**

On September 2012 an investigation of the shallow geological material in Bishkek was carried out following a south to north profile mainly following the path of the Alamedin river. The main aim of this investigation was to understand the relation between the variation in the seismic site response from the south to the north of the Big Chui channel as observed by Parolai et al.(2010) and Ullah et al., (2012). In fact, the available geological maps only distinguish between the different Quaternary terraces but do not provide detailed information on the variation of the lithology or of the grain size of the shallow unconsolidated material, that might be used for a first order interpretation of the site response variability. The main result of the investigation is that while south of the channel the alluvial material is mainly composed by boulders, pebbles and gravel (with a very low content in fine material), north of the channel the percentage of fine material (in particular silt) is strongly increasing and dominating the soil composition. In the northernmost part of the investigated area a loess sedimentary cover with thickness varying from 30-40 m in the east to 60-70 m in the west were observed.

In the following the coordinates of the visited sites with annexed pictures, as well as the position of the site within Bishkek and with respect to the site amplification as estimated by Ullah et al., (2012) is reported.

### References

Parolai, S., Orunbaev S., Bindi D., Strollo A., Usupaev S., Picozzi M., Di Giacomo D., Augliera P., D'Alema E., Milkereit C., Moldobekov B., and J. Zschau (2010). Site effects assessment in Bishkek (Kyrgyzstan) using earthquake and noise recording data. *Bull. Seism. Soc. Am.*, 100, 3068-3082

Ullah S., Bindi D., Pittore M., Pilz M., Orunbaev S., Moldobekov B., and S. Parolai (2012). Improving the spatial resolution of ground motion variability using earthquake and seismic noise data: the example of Bishkek (Kyrgyzstan). *Bull. Earthq. Eng.*, 11, 385-399

## Alamedin River Profile

**Site 1:** In the site of an ex industry it is possible to observe the stratigraphy down to 20-30 m. It consists mainly of boulders, pebbles layers and gravels (however a previous geological investigation estimates the thickness of this material to more than 100 meters).

N 42.80924°

E 074.63863°



**Site 2:** The tertiary rocks are over-lid by Quaternary alluvial material and by a thin loess layer.

N 42.79539°

E 074.65149°



**Site 3 :** The tertiary rocks are over-lid by Quaternary alluvial material and by a thin loess layer  
N 42.79319°  
E 074.65158°



**Site 4:** Boulders, pebbles and gravel.  
N 42.84211°  
E 074.63118°



Overview of the position of the first 4 investigated sites.



### Site 5.

N 42.87663°

E 074.62503°

Валуны (boulders) – 15-20%

Галечник(pebble stones) – 40-60 %

Пески (sand) – 20%





**Site 6:** The amount of finer material in the deposits is increasing.

N 42.88758°

E 074.63084°

*Валуны(boulders) – 10% (15-20 cm)*

*Песок(sand) – 40 %*

*Гравий (gravel) – 40-50%*

*Появляются суглинки (silt)*



**Site 8 (БЧК).** The Big Chui channel.

N 42.89508°

E 074.62933°



**Site 8:** The by pass between the Big Chui channel and the river.

N 42.89516°

E 074.63097°



**Site 9:** The unconsolidated material is mainly composed by sand and gravel.

N 42.89505°

E 074.63101° *Валуны(boulders)* – 5 %

*Гравий(gravel)* – 25%

*Песок(sand)* – 60-70%



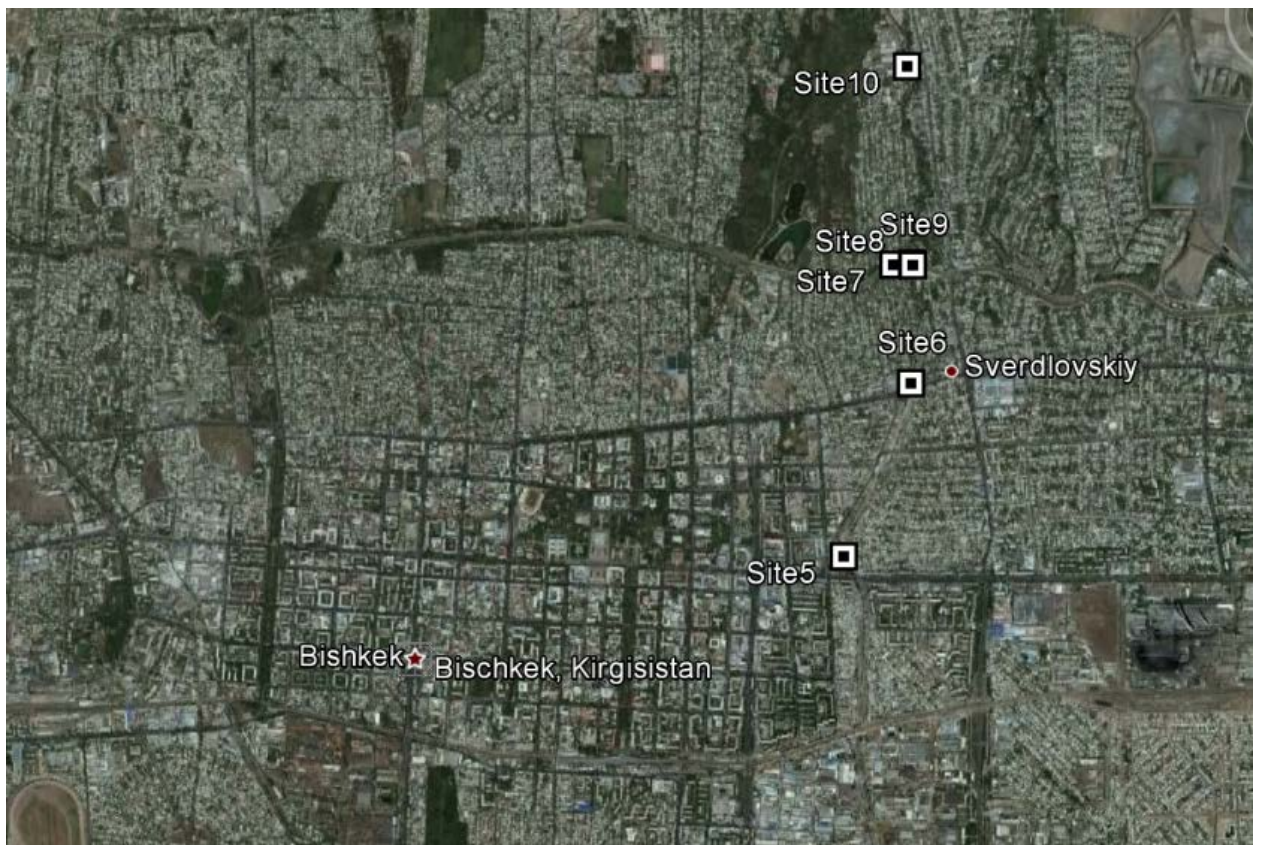
**Site 10.**

N 42.90763°

E 074.63053°



Overview of the position of the investigated sites number 5, 6, 7, 8, 9, 10.



**Site 11:** the deposits are mainly composed by silt.

N 42.92068°

E 074.62592°

*Суглинки (silt)*

*Супесь (coarsesilt)*



**Site 12:** the deposits are mainly composed by silt and sand. A small amount of decametric pebbles is observed.

N 42.92043°

E 074.62595° (photo 39-40)

*Валуны(boulders) - 5 % (15-10 cm)*

*Гравий+Песок(gravel+sand) – 15-20%*

*Супесь(coarsesilt) – 60 %*

*Суглинки (silt) – 10 %*



**Site 13:** The deposits are mainly composed by silt with a small percentage of pebble stones.

N 42.92603°

E 074.62715°

*Отложения реки Чу (Deposits of the Chu river)*

*Галька (pebble stones) – 15 %*

*Супесь (coarse silt) – 25-30 %*

*Суглинки (silt) – 60 %*



**Site 14:** The shallow geology material is composed by loess deposits.

N 42.96078°

E 074.65604°

*Лесс (loess)*



**Site 15: Loess.**

N 42.96064°

E 074.65437°



**Site 16: Different Quaternary terraces and loess deposits.**

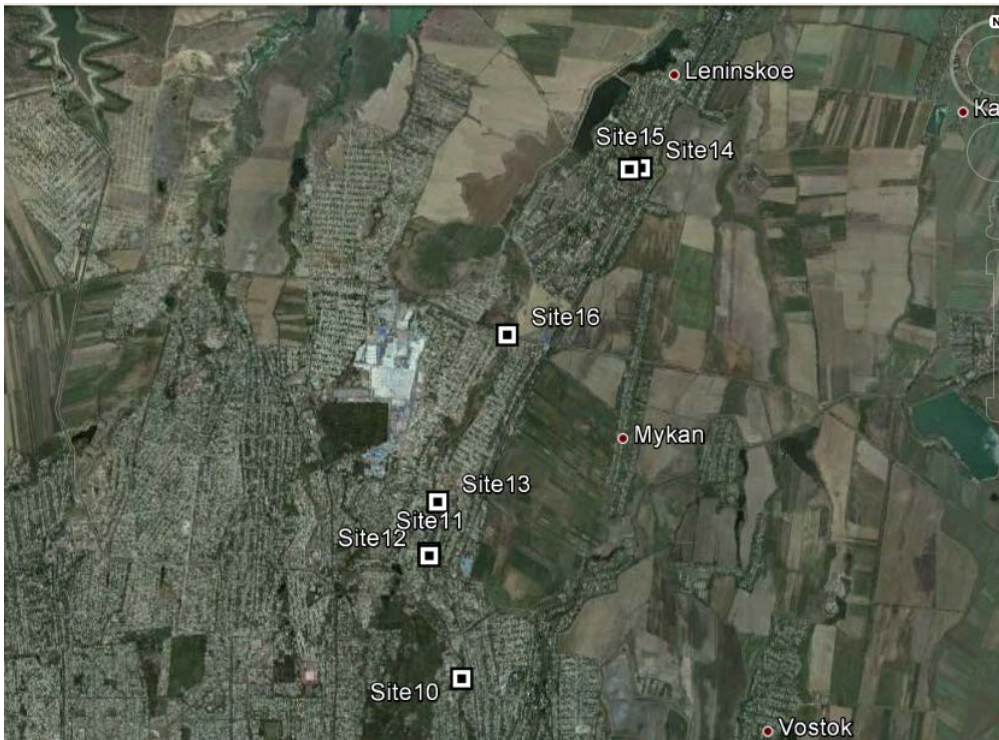
N 42.94341°

E 074.63702°

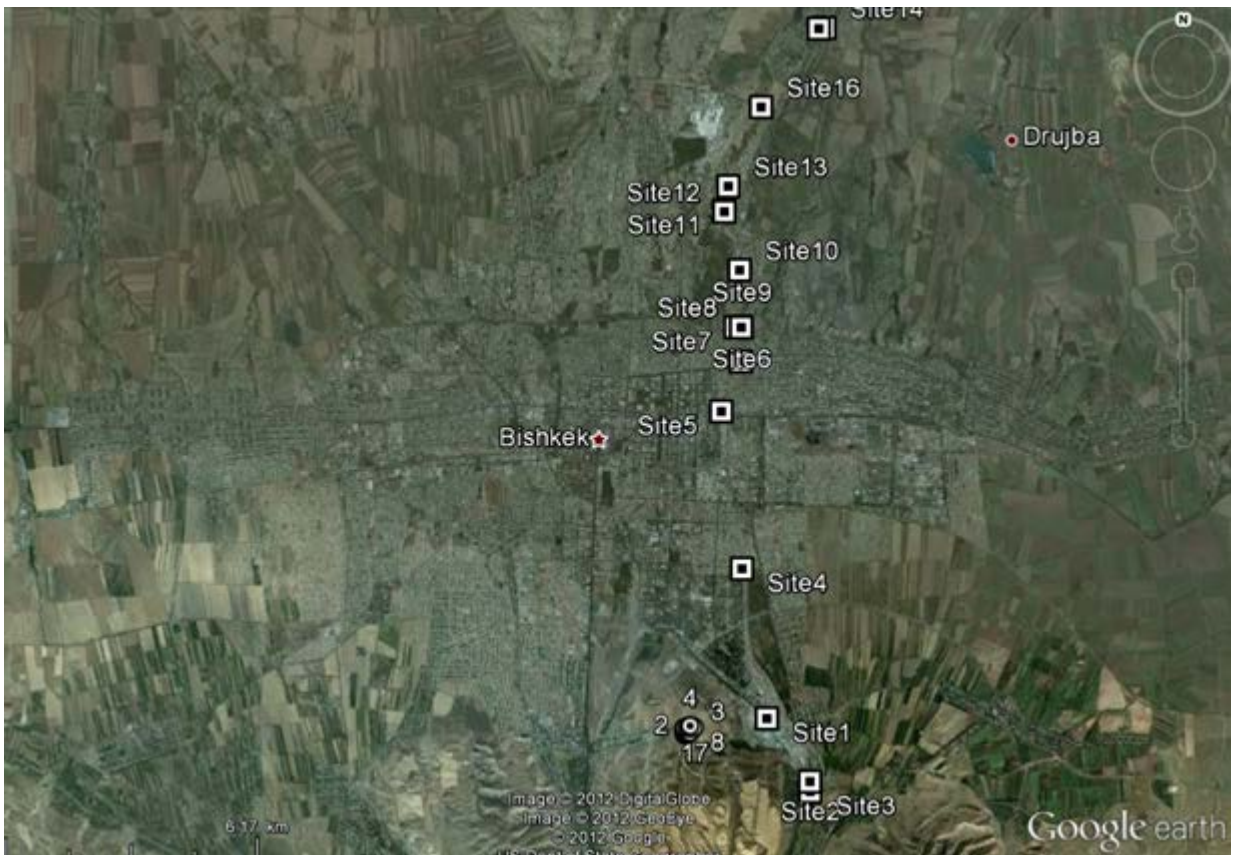
*Лесс (loess)*



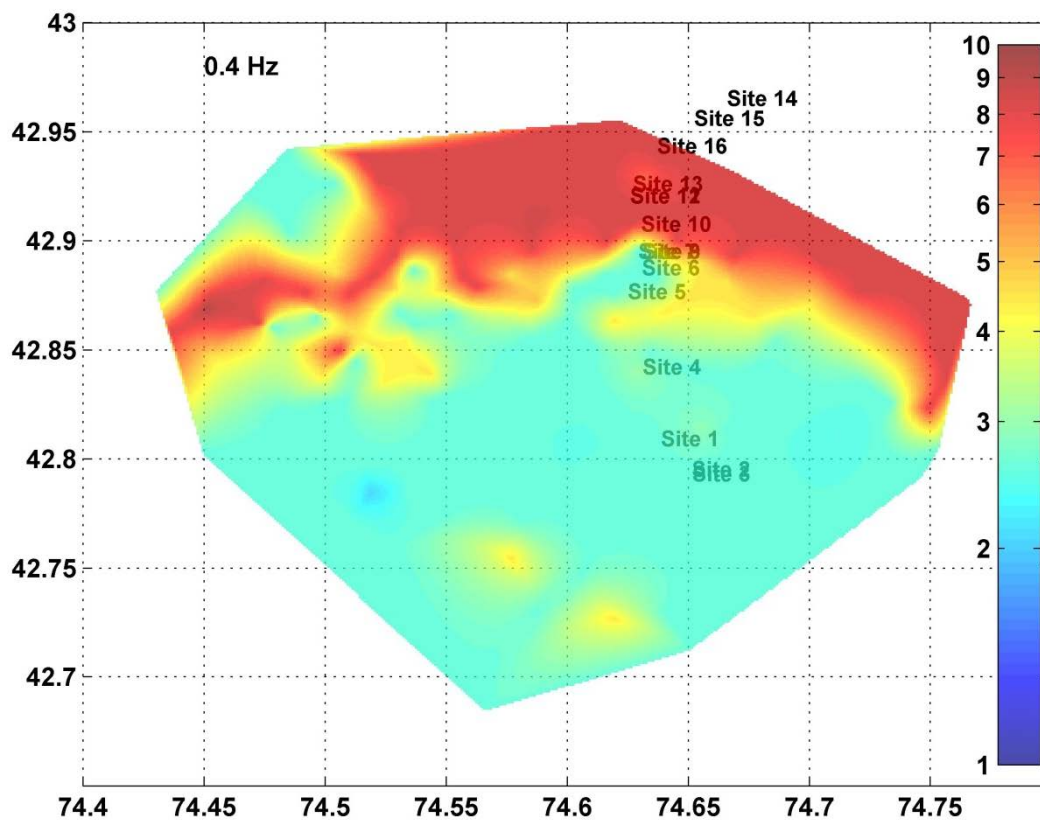
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Overview of the position of all the investigated sites.



Site locations with respect to the amplification map for the frequency of 0.4 Hz. Similar comparison is obtained when using the results for other (lower and higher) frequencies..







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