



## **Real Time Seismic Data Transmission Used by Slovenian Seismic Network**

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In the year 2000 Seismological Office started with the project Modernization of the Slovenian National Seismic Network. At the beginning of the year 2006, 23 seismic stations are in operation. Seismic stations are equipped with Quanterra Q730 data loggers and broadband Güralp CMG 40T seismometers transmitting data in real time to the network centre. At the moment we have three different type of real time seismic data transmission, leased lines, GSM protocol HSCSD and two-way satellite internet data communication. In the beginning it was planned that leased lines will be used for all data transmission. Because the stations are placed on sparsely inhabited areas, there is not possible always to obtain leased lines or it is too expensive. Two types of wireless data transmission are used. The GSM protocol HSCSD (High Speed Circuit Switched Data) was the first selection. HSCSD offers higher transfer rates by combining two or more time slots. It allows send and receive data at a speed up to 43.3 kbps. The allocation of time slots depends on end user' s subscription, air capacity and network load. The GSM equipment was set up on seven stations. A GSM connectivity terminal Nokia 30 with a built-in SIM card reader and external antenna is used as interface for connecting to a remote device. During the operation it was found that this type of communication has its advantages and drawbacks. The advantages are: independence of station site (nearly the whole country is covered by GSM signal), low cost of hardware, lower transmission costs. The drawbacks: more communication breakdowns (compared to leased lines), higher data latency, lower bandwidth. At the end of 2005, the two-way satellite internet data communication was implemented at one of the seismic stations. The system consists of 1W Ku frequency band transmitter with 75 cm elliptical antenna and modem. Supported protocols are TCP/IP, UDP and ICMP. Because the system had been installed quite recently, its advantages except low price comparable with GSM and drawbacks have been not noted yet.