



## **Lacq gas field seismicity: spatio-temporal evolution over 30 years**

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The Lacq gas field (south western France) has been discovered in the 50's and is still exploited. In 1969, a first earthquake was felt (magnitude estimated between 3 and 4) in the vicinity of the field. The first stations of a local permanent seismological network were set in 1974. During more than twenty years (from 1974 to 1997), up to 16 seismic stations have recorded the local seismic activity. This network, composed by 1-component seismometers, has recorded more than 1700 local earthquakes from 1974 to 1997 (magnitudes from 1 to 4.2). Such a database constitutes an exceptional survey of a gas field, in terms of time range (over than twenty years), number of recorded events and in terms of available geophysical data.

Since 2001, we have decided to reconsider this seismicity, following two approaches: one concerns a complete reprocessing of the 74-97 database, the other being based on the deployment of a new local network, in order to record the seismological activity which still occurs. This new local network is actually composed of six 3-component stations.

The reprocessing of the 74-97 database consists of an update of the time-picking (clock errors, heterogeneity of the hand picking, ...). Furthermore, the development of advanced algorithms of localisation with 3D velocity model (NonLinloc, Lomax et al., 2000) allows us to improve previous localisations that were mainly based on a 1D velocity model.

The new localisation and vertical sections clearly show a temporal evolution of the seismicity distribution from the central part to the boundaries of the gas field. Such evolution is coherent with the deformation model due to the depletion of a gas reservoir (Odonne et al. 1999).

This initial database is presently completed by the events recently recorded by the new network. During the last 4 years, about 500 local earthquakes have been recorded. The deployment of the network has been progressively done along this period and only 20% of these events have been localised with classical methods. The seismicity since 2001 confirms the circular distribution pattern observed during the final period of the previous database. Particularly, the southern part of the area (considered as aseismic between 1974 and 1997) was affected by several moderate earthquakes in the summer 2005.