In January and February 2014, two magnitude 6.1 earthquakes struck western Greece. The earthquakes took place within eight days of each other and occurred in a tectonically complex region.

Both earthquakes caused strong shaking on Kefalonia, the island closest to their epicentres.
Magnitude 6.1 earthquakes near Lixourion, Greece

Sunday, 26 January, 2014 at 13:55:42 UTC
Monday, 3 February, 2014 at 03:08:46 UTC

Shaking intensity

Shaking intensities up to VII-VIII were felt within 20 km of the earthquakes’ epicentres. The quake was felt as far away as the Greek Capital, Athens, 300 km to the east.

| I. Instrumental | Not felt by many people unless in favourable conditions. |
| II. Weak | Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing. |
| III. Slight | Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many to do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated. |
| IV. Moderate | Felt outdoors by many people, outdoors by a few people during the day. At night, some awakened. |
| V. Rather Strong | Felt outside by most, may not be felt by some people in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like train passing close to house. |
| VI. Strong | Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight. |
| VII. Very Strong | Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars. |
| VIII. Destructive | Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved. |
| IX. Violent | General panic. Damage considerable in poorly designed structures, well designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. |
| X. Intense | Some well build wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent. |
| XI. Extreme | Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly. |
| XII. Cataclysmic | Total destruction – everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. In some cases, even the routes of rivers are changed. |
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USGS PAGER alert for 26\textsuperscript{th} January earthquake
(Population Exposed to Earthquake Shaking)

Overall, the population in this region resides in structures that are a mix of vulnerable and earthquake resistant construction.

Recent earthquakes in this area have caused secondary hazards such as landslides that might have contributed to losses.

**Green alert level for shaking-related fatalities.**

**Yellow alert level for economic losses.** Some damage is possible and the impact should be relatively localized. Estimated economic losses are less than 1\% of GDP of Greece. Past events with this alert level have required a local or regional level response.

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**Estimated Fatalities**

- Green alert level for shaking-related fatalities. There is a low likelihood of casualties.

**Estimated Economic Losses**

- Yellow alert level for economic losses. Some damage is possible and the impact should be relatively localized. Estimated economic losses are less than 1\% of GDP of Greece. Past events with this alert level have required a local or regional level response.

**Estimated Population Exposed to Earthquake Shaking**

- Estimated exposure only includes population within the map area.

Images courtesy of the US Geological Survey
Earthquakes and historic seismicity

The earthquake epicentres (red star) are plotted on the map with regional seismicity greater than M6.0 since 1973.

The Hellenic subduction zone along southern Greece has one of the highest rates of seismicity in the Mediterranean. Locally high rates of convergence at the Hellenic subduction zone are associated with back-arc spreading throughout Greece. Crustal normal faulting throughout this region is a manifestation of extensional tectonics associated with this back-arc spreading. Historically, this region has experienced >20 moderate earthquakes with M > 6. The largest earthquake since 1973 occurred on 17 January 1983 with magnitude 6.9 to the southwest of the 2014 events. The earthquake that caused the most deaths (143 deaths in total) occurred close to the city of Athens on 7th September 1999, which had a magnitude of 6.0.
Magnitude 6.1 earthquakes near Lixourion, Greece
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Tectonic summary

The 26th January earthquake occurred as the result of strike-slip faulting in the shallow crust, which lies above the subducting African plate. The 3rd February earthquake had a stronger component of thrusting. The Mediterranean region is seismically active due to the northward convergence (4–10 mm/yr) of the African plate with respect to the Eurasian plate along a complex plate boundary.

The figure on the left shows the style of faulting (focal mechanism) with dates and sources shown below, and the right one shows schematically how blocks associated with the strike-slip faulting move.
Aftershock seismicity

So far, 42 aftershocks have been recorded following the 26 January earthquake by the USGS. The largest of these was a magnitude 5.4 earthquake, about 5 hours after the mainshock. No aftershocks have been reported yet for the 3rd February earthquake. The magnitude 6.1 earthquakes are indicated by the red stars.
Magnitude 6.1 earthquakes near Lixourion, Greece

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Damage caused by the earthquakes

Shaking from the 26th January earthquake injured at least seven people and a state of emergency was declared on the island of Kefalonia.

Following the 3rd February earthquake, authorities said that around 16 people were slightly injured (mainly by falling objects). Power and water supply was cut in the area closest to the epicentre.

Damage to man-made structures in Greece following the 26th January earthquake (photos from Alex Chatzipetros)
Magnitude 6.1 earthquakes near Lixourion, Greece

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Seismogram recordings by the BGS seismometer network of the 26 Jan quake

Body wave arrivals
Surface waves

Time of earthquake

It took just 4 minutes for the first seismic waves to arrive in the UK!

See [http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/12/Traveltime_background.pdf](http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/12/Traveltime_background.pdf) for an explanation of these seismic phases
Magnitude 6.1 earthquakes near Lixourion, Greece

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Seismogram recordings by the UK school seismometer network of the 26 Jan quake

See [http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/12/Traveltime_background.pdf](http://www.iris.edu/hq/files/programs/education_and_outreach/aotm/12/Traveltime_background.pdf) for an explanation of these seismic phases
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Find out more....

• BGS (British Geological Survey) – seismology and earthquakes – frequently asked questions [http://www.earthquakes.bgs.ac.uk/education/faqs/faq_index.html](http://www.earthquakes.bgs.ac.uk/education/faqs/faq_index.html)

• IRIS (Incorporated Research Institutions for Seismology) – learning about earthquakes [http://www.iris.edu/hq/programs/education_and_outreach/students](http://www.iris.edu/hq/programs/education_and_outreach/students)

• UK School Seismology Project – classroom activities, videos and support documents [http://www.bgs.ac.uk/schoolseismology/home.html](http://www.bgs.ac.uk/schoolseismology/home.html)


• USGS summary of the earthquakes: [http://earthquake.usgs.gov/earthquakes/eventpage/usb000m8ch#summary](http://earthquake.usgs.gov/earthquakes/eventpage/usb000m8ch#summary) & [http://earthquake.usgs.gov/earthquakes/eventpage/usb000m8ch#summary](http://earthquake.usgs.gov/earthquakes/eventpage/usb000m8ch#summary)