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## Provenance, diagenesis, tectonic setting and geochemistry of Hawkesbury Sandstone (Middle Triassic), southern Sydney Basin, Australia

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The Hawkesbury Sandstone is an important groundwater reservoir in the southern part of the Sydney Basin, Australia. However, its diagenesis, provenance and its impact in the reservoir quality are virtually unknown. The present study aims to reconstruct the parent rock assemblages of the Hawkesbury Sandstone, their tectonic provenance and the physiographic conditions under which these sediments were deposited. Samples from the EAW 18a and EDEN 115 fields representing the Middle Triassic Hawkesbury Sandstone were studied using a combination of petrographic, mineralogical and geochemical techniques. The Hawkesbury Sandstone is yellowish brown in color, siliceous and partly calcareous; it originated as sands were deposited in fluvial channels. Texturally, Hawkesbury Sandstone is medium-to coarse-grained, mature and moderately well sorted. Scarcity of feldspars indicates that the rock is extensively recycled from a distant source. Hawkesbury Sandstone has an average framework composition of Q92.07F0.31R7.62 and 95.9% of the quartz grains are monocrystalline. The Hawkesbury Sandstone is mostly quartz arenites with subordinate sublithic arenites and bulk-rock geochemistry supports the petrographic results. Petrographic and geochemical data of the sandstones indicate that they were derived from craton interior to quartzose recycled sedimentary rocks and deposited in a passive continental margin of a syn-rift basin. The cratonic Lachlan Orogen is the main source of Hawkesbury Sandstone. The chemical index of alteration, plagioclase index of alteration, and chemical index of weathering values (3.41-87.03) of the Hawkesbury Sandstone indicate low-moderate to high weathering, either of the original source or during transport before deposition, and may reflect low-relief and humid climatic conditions in the source area. Diagenetic features include compaction: Kaolinite, silica, mixed-layer clays, siderite, illite and ankerite cementation with minor iron-oxide, dolomite, chlorite, and calcite cements. Silica dissolution, grain replacement, and carbonate dissolution greatly enhance the petrophysical properties of many sandstone samples.

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## Current trends in seismic monitoring in the Middle-East for research and earthquake hazard

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Seismic waves travel inside and on the surface of the Earth with no regard to political boarders or geography. The Middle East today is full of seismic stations and standalone national data centers that fall short of fulfilling their potential monitoring capabilities. For Example, North Iraq Seismological Network (NISN), Iraq Seismological Network (ISN), Jordan Seismological Observatory (JSO), Qatar Seismic Network (QSN), Saudi Arabia Geological Survey (SGS) seismic network, Oman Seismological Network (OSN), Kuwait National Seismic Network (KNSN), UAE National Center of Meteorology and Seismology (NCMS) and Dubai Seismic Network (DSN), Bahrain National Seismic Monitoring Station (NSMS), Iran International Institute of Earthquake Engineering and Seismology (IIEES), and Kandilli Observatory and Research Institute (ISK), among others, do not share data in real-time with neighboring countries as if all damaging earthquakes can only occur within the boundaries of their respective borders. The seismic risk that a country like UAE may encounter, is from neighboring earthquakes in Iran rather than from local seismicity. The purpose of sharing continuous seismic data in real-time is to take full advantage of a significantly expanded virtual network at no or little communication cost, since it does not require building more seismic station in each county. Without sacrificing control over their networks, data centers carry their own seismic data processing. Seismological data centers and institutions in the Middle East may enter into bi-lateral agreements to share their data in real-time. NISN in Iraq and JSO in Jordan are preparing to demonstrate the feasibility and advantages of this virtual Middle East Seismographic Network (vMESN). vMESN objective is to virtually expand the existing countries seismic networks and enhance seismological research in the Middle East and support required civil protection activities.

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