Introduction:
The Atlit prehistoric site is located on the northern coastal plain of Israel (Fig. 1), within calcarenites (Fig. 2). The site's significance lies in its proximity to the renowned Carmel Caves (Tabun, Skhul, Qumran and Gammel), which contain prehistoric sequences that go back 400 ka.

Flint artifacts of Middle Paleolithic age, faunal remains and hearths were found above a fossil beachrock within palaeo-caves, which formed during a high sea-stand and were later filled with aeolianites (Ronen et al. 2008).

The site post-dates MS 5 as it overlies a beachrock of that age. Furthermore, the age of the site was previously bracketed by IRSL dating of the sediments below and above one of the caves, to 144±27 and 73±12 ka, respectively (Fig. 2; Frechen et al. 2004).

To better constrain the age of the archaeological finds, three new samples were collected from the calcarenites infill of two caves, from the flint and bone-bearing beds.

The sediments are highly calcareous and indurated. Both quartz and alluvial feldspars were extracted from the sediment samples and were measured using a variety of luminescence signals and protocols.

Methods:
Quartz was purified by sieving to the selected grain size, dissolving carbonates by 10% HCl, removing heavy minerals and most feldspars by magnetic separation, and dissolving the remaining feldspars and the quartz with 42% HF (for 40 min), followed by soaking in 36% HCl overnight to dissolve any fluorides which may have precipitated. Allai feldspars were concentrated after sieving and dissolving carbonates by two density separations, at 2.62 g/cm³ followed by 2.58 g/cm³. The feldspar grains were not etched.

Alpha, beta and gamma dose rates were calculated from the radioactive elements measured by ICP-MS (U and Th) or ICP-AES (K). Errors are 3%, 5% and 10% of measured values for K, U and Th, respectively. Internal beta dose rate for allai feldspars was calculated using K-contents of 12±0.5% and an estimated value of a 0.15±0.05. Cosmic dose rate was calculated from bernal depth, estimated at 8±1 m, of 85±8 μGy/a. Moisture contents were estimated at 10±3%.

Luminescence measurements:
Quartz OSL was measured on 2 mm aliquots using the single aliquot regenerative dose (SAR) protocol. Quartz De was also measured using the VSL (total stimulated) protocol.

OSL: OSL was measured using the single aliquot regeneration (SAR) protocol. OSL was measured on 2 mm aliquots of quartz using the single aliquot regeneration (SAR) protocol. OSL was measured on 2 mm aliquots of quartz using the single aliquot regeneration (SAR) protocol. OSL was measured on 2 mm aliquots of quartz using the single aliquot regeneration (SAR) protocol. OSL was measured on 2 mm aliquots of quartz using the single aliquot regeneration (SAR) protocol.

The ages:
Fig. 4 shows the ages with their uncertainties. The dashed lines show the average age and SD for each sample:

- ATL-1 = 90 ± 6 ka
- ATL-2 = 93 ± 8 ka
- ATL-4 = 70 ± 6 ka

Samples ATL-1 and ATL-2 are from the same unit, and indeed their ages are very similar.

Discussion and implications:
The ages obtained using the different minerals, luminescence signals and measurement protocols are overall comparable, and are within errors of each other. The IRD ages have the lowest scatter, however for truly accurate ages the internal dose rate and d-value need to be better known, and the issue of using measured or assumed K-content need to be resolved.

The hand-to-breast signals such as the VSL and IRD do not necessarily give higher ages, indicating that the samples were very well bleached at the time of deposition.

Taking together all the ages, the best estimate of the time of deposition of the sediments embedding the artifacts in Cave III is ~90 ±5 ka. The age of the sediments from Cave II is ~70 ka. Possibly the caves were indeed used at different times as humans frequented this area several times over prehistoric periods.

The age range for Cave III is comparable to the ages of the Mousterian Layer C in Tabun and the Levallois-Mousterian in Skhul (Ronen et al. 2008), located only 6 km to the south-east (Fig. 1).

It is very tempting to envision a scenario whereby the humans living in the Carmel caves frequented the coast and used the smaller caves found within the coastal aeolianites. Even with lower sea level at that time of up to ~40 m, the coastline was only 3.5 km away from Atlit.