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Supplementary Material

**Burial and exhumation history of the Daday Unit (Central Pontides, Turkey): implications for the closure of the Intra-Pontide oceanic basin.**

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**1. Mineral chemistry and thermobaric estimations**

Running conditions during microprobe chemical analyses were 15 kV accelerating voltage and 5 nA beam current on a Faraday cage. Counting time for the determined elements ranged from 10 to 60 s at both peak and background. Nominal beam spot size ranges from 1 to 3 μm for the analyses of all minerals. Natural and synthetic silicates and oxides were used for instrumental calibration.

The thermodynamic calculations are performed with TWEEQ software (Berman 1991). The thermodynamic data and the solid-solution models are from Berman (1988; 1990) for all phases except K-white mica and chlorite. The former were studied with the Parra *et al.* (2000, 2002a) models, while the latter with Parra *et al.* (2000) and Vidal *et al.* (2001, 2005). The end-members to use for the thermodynamic calculations, should describe the white mica and chlorite chemical composition. For the white mica, the following end-members were used: Mg-Al-celadonite (Mg-ACel)Phe, pyrophyllite (Prl)Phe and muscovite (Ms)Phe, whereas for the analyzed chlorites, characterized by high Si contents, we used 4 end-members: Mg-sudoite (Sud)Chl, clinochlore (Clin)Chl , Fe-amesite (Fe-Ames) Chl and daphnite (Daph)Chl. The presence of Fe3+ will affect the activity of chlorite end-members, although it is generally neglected because no difference can be made between Fe2+ and Fe3+ with the microprobe. An estimation of Fe3+ in chlorite can be done using the criterion proposed by Vidal *et al.* (2006).

The number of reactions that can be computed for a given paragenesis involving chlorite and phengite, depends on the number of end-members used to express the compositional variability of these minerals. The K2O-Al2O3–FeO–MgO-SiO2-H2O system, the P-T conditions for the chlorite-phengite-quartz-H2O assemblage are given by the intersection of 13 equilibria, among which 3 are independent. Some scatter of the intersection points in the diagrams was observed. According to Vidal & Parra (2000), this scatter results from cumulated errors in each reaction, which stem from the uncertainties in the thermodynamic standard-state properties of the end-members and the solution models, departure of the analysed compositions from equilibrium compositions and analytical uncertainties. The first source of error, resulting from the uncertainties associated with the thermodynamic data, is difficult to estimate because the thermodynamic standard-state properties were calibrated using experimental and natural data of various levels of confidence. However, it is likely that the uncertainties in the thermodynamic data have a systematic effect on the calculated locations of the intersection points, but not on their relative positions. Finally, even if the thermodynamic data were “perfect”, imprecision on the analysed compositions places limits on the precision with which P-T can be estimated (De Andrade *et al.* 2006).

The average P-T estimates and their associated deviations (σP and σT) were calculated for each mineral pair by the INTERSX software included in the TWEEQ package (Berman 1991). According to Berman (1991), Vidal & Parra (2000), Trotet *et al.* (2001) and Parra *et al.* (2002b), the magnitude of the pressure (σP) and temperature (σT) scatter for the calculated equilibria lead to reject the chlorite–phengite pairs, which are considered to be out of equilibrium. Assuming that the thermodynamic data are “perfect” and equilibrium is achieved, the scatter resulting from analytical uncertainties is given by the precision of the microprobe analysis. It can be calculated with a Monte Carlo technique (Lieberman & Petrakakis 1991; Vidal & Parra 2000), which lead to the estimation of the maximum permissible scatter (σPmax and σTmax) of any P-T estimate. The estimated σPmax and σTmax values for assemblages including chlorite and phengite are 0.08 GPa and 25 °C, respectively (Vidal & Parra 2000; Trotet *et al.* 2001; Parra *et al.* 2002b; Augier *et al.* 2005; Rimmelé *et al.* 2005*).*

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**2. 39Ar/40Ar geochronology**

Muscovite separates used for 40Ar/39Ar analysis were prepared by crushing rocks, sieving to the grain size of 60-180 μm and separated using heavy liquids separation and dry shaking at the Middle East Technical University in Ankara (Turkey). The 40Ar/39Ar analyses have been conducted at Group 18 Laboratories in the Arizona State University.

Multiple crystals of muscovite were packed in Al foil, loaded into Al discs, and stacked in a flame-sealed glass vial for irradiation. Standards of HD-B1 with an age of 24.18 ± 0.009 Ma (Schwarz & Trieloff 2007) were placed within wells adjacent to the samples and throughout the entire stack to permit detailed characterization of the irradiation flux both horizontally and vertically. Samples were irradiated in the Cd-lined (CLICIT) facility of the Oregon State University (USA) TRIGA reactor for 4 hours.

Samples were fused with a Photon Machines 55W CO2 laser. Isotope data were collected using a Nu Insturments Nobelesse multi-collector mass spectrometer, run in single collector mode. Samples were heated for 10 seconds prior to 120 seconds clean-up. Extracted gases were cleaned using 2 GP50 SAES getters (one operated at 450°C and one at room temperature). The extraction, clean up and data collection processes were entirely automated. Average backgrounds ± standard deviations from all five blank runs were used to correct isotope abundances. Air calibrations were collected after every 10 analyses to monitor mass discrimination. A 40Ar/36Ar value of 295.5 was used to correct the data for mass discrimination. A power law function was used for the mass discrimination correction (Renne *et al.* 2009).

Berkeley Geochronology Centre software ‘mass spec’ was used to regress and reduce age data using the decay constant of 5.543 x 10-10 a-1 from Steiger & Jager (1977). The isotope data were corrected for blank, radioactive decay, mass discrimination and interfering reactions. Age uncertainties are reported to 2σ; uncertainties on the isotopic measurements are reported to 1σ.

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**3. Fission track**

Apatite grains were separated from about 5 kg bulk samples using standard heavy liquids and magnetic separation techniques. Mounts were ground, polished and etched with 5 N HNO3 at 20 ± 1 °C for 20.0±1s to reveal the spontaneous tracks. Samples were then irradiated with thermal neutrons in the Lazy Susan facility of the Triga Mark II reactor at the University of Pavia (Italy). To measure the neutron fluency, standard glass CN5 was used as dosimeters. After irradiation, the low-U muscovite detectors were etched in 40% HF at 20 °C for 45min to reveal the induced fission-tracks. Apatite fission-track ages were measured and calculated using the external-detector and the zeta-calibration methods (Hurford & Green 1983) with a zeta value (referred to Fish Canyon Tuff and Durango apatite standards, Hurford 1990) of ζ=360±11. The annealing behaviour of fission tracks in apatite is sensitive to chemical composition. Chlorine rich apatites are more resistant to track annealing than fluorine-rich apatites (O'Sullivan & Parrish 1995). In order to quantify chlorine and fluorine content of apatite crystals Dpar values (diameter of etched spontaneous fission tracks measured parallel to the crystallographic c-axis) were measured in all the samples (e.g. Barbarand *et al.* 2003; O'Sullivan & Parrish, 1995). We routinely measured 4 etch pits in each grain. A small Dpar value (smaller than 2 μm) is typical for fluorine-rich apatites and a larger value (2–5 μm) is characteristic for chlorine rich apatites. Only TINTs (tracks reached by the etching because they intercept a surface track, Bhandari *et al.* 1971) made part of the measured length distributions as recommended by Ketcham *et al.* (2005). We performed a thermal modelling using the HeFTy software (Ketcham 2005). In HeFty, fission-track lengths normalized for track angle using c-axis projection (Ketcham *et al.* 2007a, 2009) and the annealing model of Ketcham *et al.* (2007b) was used.

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