100–500 m, combined with a range of realistic subsidence rates and a high-frequency eustatic curve similar to the Quaternary glacio-eustasy, in creating depositional architectures close to the real examples.

For the forward modelling runs, we used the CONG program developed by D. Waltham and G. Nichols. The principal aim was to discriminate between the influence of the accommodation added by the pre-depositional bathymetry and the accommodation created by eustasy, syndepositional subsidence, and compaction. In both cases modelled, the main variable was the initial bathymetry, and other variables (eustasy, subsidence, supply) were held constant between the runs. Several series of runs were tested for different sea-level curves in the Cretaceous case, and for different subsidence rates in the Quaternary case.

Our experiments demonstrate that the dimensions of the depositional system, strongly dependent on the initial depth of the basin prior to the onset of sedimentation, significantly influence the internal geometries and stacking patterns of sequences formed in response to high-frequency sea-level changes. The initial depth sets the ratio between the accommodation available at the basin margin versus the magnitude of relative sea-level (RSL) change. (1) In case of large initial depth, the short-term accommodation is dominated by vertical dimension: deltas are characterized by steep foreset slopes and short progradation distances. Because the magnitude of the RSL fluctuations equals only a fraction of the total foreset height, high-frequency sequences in such settings can be contained largely within the foresets and part of the topsets, unless the long-term relative sea level results in flooding of the whole depositional system. (2) In case of small initial depth, the accommodation is dominated by horizontal dimension, i.e. flat slopes of shelf-type deltas and long progradation distances. The RSL magnitude is then close to the vertical dimension of the whole depositional system, and short-term, small-scale RSL changes result in rapid shifts of the shoreline across tens of kilometres and in vertical stacking of thin deltaic sequences. A dramatic illustration of this relationship is the Gulf of Corinth case, where adding a reasonable initial depth to the model setup led to a good fit with the observed data, because it allowed the evolution of thick foresets, affected by the base-level changes (of c. 80–100 m magnitude) only in their uppermost parts.

This further strengthens the point that a specific stacking pattern of clastic strata in one location does not have a predictive potential for deriving cyclo- or sequence-stratigraphic „templates“ usable in a location of different physiography. Basin modelling efforts which fail to recognize the importance of initial depth for setting the geometry and dimensions of the depositional systems will result in false predictions of geometric relationships between stratigraphic units and incorrect interpretations of basin history.

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Comparative Rheology Map – a New Approach Connecting Experimental and Natural Observations

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Strength (differential stress) for naturally deformed rocks at different crustal levels is usually extrapolated using experimental flow laws or paleopiezometric equations where incoming variables are temperature and steady recrystallised grain size, respectively. Experimental flow law equations are favoured by geologist dealing with large-scale processes while paleopiezometric equations are commonly used to estimate flow stress in narrow shear zones. Shortcoming of the present approaches is that temperature and recrystallised grain size are not assessed together in estimating flow stress in natural tectonites.

Derby and Ashby (1987) suggested that nucleation and grain growth are competing processes that determine recrystallised grain size. De Bresser et al. (1998) and Shimizu (1998) proposed temperature-dependent linear type of paleopiezometric equation based on the above suggestion. In their model, flow stress decreases more rapidly with increasing grain size and increasing temperature. Principal goal of this contribution is to use this approach in assessing flow stress in naturally deformed marbles and quartzites.

De Bresser et al. (1998) noted, that temperature-independent paleopiezometers lie at the boundary between grain-size insensitive (GSI) creep and grain-size sensitive (GSS) creep suggesting equal contribution of both regimes on bulk strain rate:

$$\dot{\varepsilon}_{(GSI)} = \dot{\varepsilon}_{(GSS)} \qquad (1)$$

$$A_{(GSI)} \cdot \Delta\sigma^{n} \cdot \exp(-H_{(GSI)}/RT) = A_{(GSS)} \cdot \Delta\sigma^{m} \cdot d^{-p} \cdot \exp(-H_{(GSS)}/RT) \qquad (2)$$

in which $\dot{\varepsilon}$ is strain rate, Δσ is flow stress, d is grain size, H is the apparent activation enthalpy for flow, T is absolute temperature, n and m are stress exponents and A is an empirical constant. Then, flow stress can be expressed as a function of grain size and temperature

$$\Delta\sigma = (A_{(GSS)}/A_{(GSI)})^{1/n-m}.d^{-p/n-m}.\exp[(H_{(GSI)}-H_{(GSS)})/RT(n-m)] \quad (3)$$

Flow stress calculated for given temperatures is plotted into log grain size / log differential stress diagram expressing changes in strength of quartzites and marbles with changing temperature and grain size.

Equation (1) eliminates the influence of strain rate on flow strength. However, assumption that GSS and GSI creep exhibit equal contributions to bulk strain rate is not always valid because of changes in grain size and temperature throughout geological history. (Hickey and Bell 1996) suggested that changing $\dot{\varepsilon}$/T ratio during dynamic recrystallisation of monomineral polycrystalline aggregate causes changes in average grain size. Therefore, strain rate has to be taken into account, so that the equation (1) could be rewritten as

$$\dot{\varepsilon}_{(GSI)} = 10^{k}\cdot\dot{\varepsilon}_{(GSS)} \quad (4)$$

where k is a dimensionless strain rate parameter. If dynamic recrystallisation is associated with positive k values, then grain-boundary sliding will dominate and flow stress calculated from paleopiezometric equation will decrease. If dynamic recrystallisation is associated with negative k value, dislocation creep will dominate and flow stress can increase. Variable contribution of individual creeps can be thus controlled by intensity of texture as it was described in the experiment (Casey et al. 1998) and model (Casey and McGrew 1999).

This approach can be used to construct comparative rheological maps to assess strength of contemporaneously flowing two rock-forming minerals with large database of experimental flow parameters, e.g. marbles and quartzites. We can demonstrate that, e.g., marbles at high temperatures exhibit higher stress values than quartz and are therefore more competent.

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Mafic Metavolcanic Rocks of the Sedlčany–Krásná Hora Islet (The Islet Zone of the Central Bohemian Pluton): Interpretation of Geochemistry and Petrology

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The Sedlčany–Krásná Hora Islet is an isolated remnant of the metamorphic mantle of the Variscan Central Bohemian pluton shaped into an uneven rectangle ca. 20 by 10 km in size, elongated in the SE–NW direction, and composed of Late Proterozoic(?) to Early Palaeozoic rocks (Chlupáč 1989; Svoboda 1933). The Palaeozoic sequence is documented by fossil assemblages found in three stratigraphic levels (Ordovician ichnofossils, Silurian graptolites, Devonian crinoids) (Chlupáč 1989).

The bimodal metavolcanic rocks are present mostly within the metasedimentary sequence of the Late Proterozoic and/or Cambrian (?) Svrchnice Fm. (Chlupáč 1989). The mafic metavolcanics (lavas or subvolcanic bodies) are of Late Proterozoic and/or Early Palaeozoic age, and are distributed in the NW part of the Sedlčany–Krásná Hora Islet. In the metavolcanic suite, mafic metavolcanics (primarily basalts and basaltic andesites) prevail over felsic rocks (metamorphosed rhyolites). The mafic rocks are distinguished into two texturally defined types. Metabasites of the first type are very fine-grained to almost massive rocks, which exhibit somewhat more advanced degree of recrystallization compared to the representatives of the second type. The second type of metabasites is rich in relics of clinopyroxene phenocrysts.

The magmatic mineral assemblage of the mafic metavolcanic rocks is obliterated due to regional and contact metamorphisms. The existing mineral association of mafic rocks usually consists of pyroxene, amphibole and plagioclase. Some of the less altered samples contain relics of diopsidic pyroxene. Pyroxene phenocrysts are partially or completely replaced by uralitic amphibole. Amphiboles are calcic types represented by actinolite, actinolitic hornblende and magnesio-hornblende (Leake 1978). Plagioclases show wide variety of compositions from andesine to bytownite (Deer et al. 1966). Chlorite, epidote and biotite are accessory minerals.

In the TAS classification diagram (Le Maitre 1989) the mafic metavolcanics plot into the fields of basalts and basaltic andesites, with SiO_2 concentrations ranging from 48 to 52 wt.%. They include rather primitive basalts with MgO contents of 8-15 wt.%.