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The Earth's surface response around Taiwan orogenic belt and adjacent areas commonly display complex 3D spatial and temporal evolution, which are still difficult to study the geological process. Coupled deep and surface process models based on Badlands software represent a powerful tool to investigate the structural development and the associated sedimentation. In order to study the palaeogeomorphic reconstruction, the paleo-bathymetry was restored using Badlands and data assimilation technique since Miocene to the recent based on the published geological data. We established forth representative end-member patterns associated with the different forcing. Our numerical simulation focuses on reconstructing the ancient paleogeomorphology and examining the impact of ocean currents in the Taiwan orogenic belt and its surrounding regions. According to simulation results, sedimentary areas influenced by ocean currents have gradually migrated eastward since the Miocene, which began approximately 15 Ma. We observed that the impact of the Taiwan Warm Current and the Kuroshio on sediment deposition was relatively limited between 15 Ma and 10 Ma. Furthermore, we found that the uplift of the Taiwan orogeny around 5 Ma intensified the sedimentary transport function of the Taiwan Warm Current, facilitating the sedimentation in the Taiwan Strait and the South China Sea continental shelf basin. Cenozoic paleogeomorphic reconstruction of the study area can not only help us understand the evolutionary process of the Taiwan orogenic belt, but also provide fundamental paleogeomorphic data for the other subjects.

Keywords: Palaeogeomorphic reconstruction; Coupled deep and surface process modeling; Deep dynamic process; Earth's surface system; Taiwan orogenic belt.

Poster 23: Reconstruction of provenances and magmatic protoliths of Ediacaran and Silurian clastic rocks of the Uzbek South Tien-Shan

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The South Tien-Shan (STS) is located in the southwestern Central Asian Orogenic Belt (CAOB). STS formed by the closure of the Turkestan branch of the Paleo-Asian Ocean (PAO) and collision of the Paleo-Kazakhstan continental block in the north and the Karakum microcontinent and Tarim continent in the south in late Carboniferous time (Biske and Seltmann, 2010). The STS represents an accretion-

collisional belt consisting of oceanic plate stratigraphy (OPS) rocks: oceanic floor basalts, pelagic and hemipelagic sediments, turbidites, limestones and, to a lesser degree, supra-subduction ophiolites and metamorphic rocks.

We studied clastic rocks of Ediacaran and Silurian formations of the Kyzylkum and Nurata segments of the western STS cropped out in the Tamdytau and Bukantau ranges (Kyzylkum) and northern Nuratau Range. The Ediacaran formations (Besapan, Kaltadavan) consist of thick rhythmically bedded flyshoid-type sediments. The Silurian Baimen Fm. is dominated by turbidites occurring as tectonic sheets. The sandstones are spatially associated with OPS lithologies (oceanic pillow basalt, pelagic chert, hemipelagic siliceous mudstone, siltstone, shale) as well as with volcanic rocks of supra-subduction origin and limestones of various origins. The Ediacaran and Silurian ages of the sedimentary rocks were constrained by microfossils (conodonts, brachiopods, graptolites) (Akhmedov et al., 2001). However, the siliciclastic sedimentary rocks (sandstones) seldom contain well-preserved fossils and there remains a deficiency of up-to-date geochronological and geochemical data from such rocks that would allow reconstructing their geodynamic origins.

The U-Pb ages of detrital zircons show two Ediacaran major peaks at 624 and 608 Ma and a Silurian peak at 445 Ma (Konopelko et al., 2022). The Ediacaran samples yielded maximum depositional ages (MDA) of 580–540 Ma (Ediacaran-early Cambrian). The MDA of the Silurian samples is ca. 440 Ma (Llandovery). All samples display similar U-Pb detrital zircon age patterns with major peaks at 650–570, 870–730, 1050–900 and 2400 Ma and a smaller peak at ca. 1800 Ma all those indicating similar depositional environments and sources. The age patterns are similar to the summarized U-Pb age spectra of zircons from various igneous rocks of the basement of the Tarim Craton (Zhang et al., 2013).

Petrographically, the clastic rocks under study are fine-medium grained poorly- to medium sorted sandstones, which can be classified as litharenites, feldspathic litharenites, and lithic feldsarenites (Folk, 1980). According to the classification of Pettijohn (Pettijohn et al., 1972) they are litharenites and greywackes. The values of the index of chemical variability, ICV (Cox et al., 1995), span 0.9 - 2.6, indicating that the sandstones are immature and mature sedimentary rocks. The chemical indexes of alteration, CIA (Nesbitt and Young, 1982), are from 47 to 72 implying a provenance dominated by weak to strongly weathered rocks. The systematics of Dickinson (Dickinson et al., 1983) indicates that the sandstones were derived from a recycled orogen, which could be either a supra-subduction complex or a fold-and-thrust belt. The concentrations of major oxides are generally higher than those of PAAS (Taylor and McLennan, 1985). In the binary diagrams sandstones have clearly negative correlation between SiO_2 and TiO_2, Al_2O_3, Fe_2O_3, MgO. Their trace element compositions resemble those of arc-related igneous rocks. The La/Th – Hf (Floyd and Leveridge, 1987) and TiO_2 – Fe_2O_3+MgO (Bhatia, 1983) tectonic discrimination systematics indicate that the sandstones were derived by erosion of continental arc and/or active continental margin, respectively.

The Ediacaran sandstones are characterized by the negative values of εNd(t) ranging from –15 to –7 with crustal Nd model ages (T_{DM}) from 2.1 to 1.8 Ga. The values of εNd(t) for Silurian sandstones are also negative ranging from –16 to –9 with T_{DM} from 2.5 to 1.7 Ga suggesting the presence of recycled Precambrian continental crust in the provenance. The Ediacaran sandstones are characterized by a wide range of εHf(t) from −20 to +10 that suggests compositionally diverse provenances including both ancient continental crust and juvenile sources. The Silurian sandstones also yielded variable εHf(t) values ranging from −20 to +4.

As some of the 650–570 Ma detrital zircons from the Ediacaran sandstones possess juvenile Hf isotope characteristics, we suggest that they were derived from a mature intra-oceanic arc. On the contrary, the predominance of recycled 500–400 Ma detrital zircons in the Silurian samples indicates erosion of a continental arc or an active continental margin. Thus, the U-Pb zircon age data, the dominantly greywacke composition of the sandstones and the trace element data are all indicative of two periods of subduction-related orogeny: latest Neoproterozoic – earliest Cambrian and Silurian. The overall U-Pb ages of detrital zircons from the Kyzylkum and Nurata sandstones and adjacent regions show a middle-late Cambrian-Ordovician magmatic lull, that could be related to a shift of tectonic regime from the western Pacific-type (immature to mature intra-oceanic arcs) to the eastern Pacific-type (continental arc/active continental margin).

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Poster 24: Preliminary Study on Conversion of Bamboo Waste into Biochar via Pyrolysis Process

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Pyrolysis process of biomass is defined as the decomposition process whereby the biomass is decomposed by heat with limited amount of oxygen in producing products such as bio-oil, biochar, and syngas. Pyrolysis can be separated into slow and fast pyrolysis, whereby fast pyrolysis utilizes fast heating rate with bio-oil as the main product. Slow pyrolysis utilizes slow heating rate up to hours and days of residence time and produces biochar as the main product. Biochar has been widely studied as an adsorbent into ranges of containment including but not limited to microplastics and nano plastics, Hg (II) adsorption, Adsorption of chromium (VI), sulfamethoxazole and ethofumesate, phenol (Bhatia and Saroha, 2024; Ji et al., 2024; Li et al., 2024; Lopez-Cabeza et al., 2024; Masuku et al., 2024). Bamboo biochar has a high carbon to nitrogen value allows for a stronger biochar stability. Utilization of bamboo biochar in soil remediation is usually studied in reducing significant amount of specific heavy metal such as arsenic and cadmium above the safety level (Tang et al., 2024; Wei et al., 2024). Biochar has great potential but faces many issues in wide-scale implementation such as secondary pollution, limited equipment, limited research, long-term stability of biochar, and large initial start-up cost. While this study would be focus on the yield of the bamboo biochar and the yield of paddy in