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UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Geokemija sedimentnih karbonatov
Course title:	Geochemistry of Sedimentary Carbonates

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Okoljske in regionalne študije, doktorski študij 3. stopnje	Paleobiologija in sedimentarna geologija	brez letnika	/
Environmental and Regional Studies, doctoral study, 3rd cycle	Palaeobiology and Sedimentary geology	not specified	/

Vrsta predmeta / Course type	Izbirni/Elective
Univerzitetna koda predmeta / University course code:	DIP07

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	10	30			120	6

Nosilka predmeta / Lecturers:	Andrea Martín Pérez

Jeziki / Languages: Predavanja / Lectures:	Slovenščina, angleščina/Slovenian, English
Vaje / Tutorial:	Slovenščina, angleščina/Slovenian, English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Končana druga bolonjska stopnja ali univerzitetni študij VII stopnje.

Prerequisits:

Second-cycle Bologna degree or a university (level VII) degree.

Vsebina:

- Dolgoročni ogljikov cikel.
- Mineralogija, kemija in reakcijska kinetika glavnih karbonatnih faz (kalcit, dolomit, aragonit).
- Sistem CO_2-ogljikova kislina in kemija raztopin.
- Interakcije med karbonatnimi minerali in raztopinami.
- Koprecipitacija in trdne raztopine karbonatnih mineralov.
- Biološko formirani in inducirani karbonatni minerali
- Karbonatni sistem v oceanih in akumulacija globokomorskih karbonatnih sedimentov.

Content (Syllabus outline):

- Long-term carbon cycle.
- Mineralogy, chemistry and reaction kinetics of major carbonate phases (calcite, dolomite, aragonite).
- The CO2-carbonic acid system and solution chemistry.
- Interactions between carbonate minerals and solutions.
- Coprecipitation reactions and solid solutions of carbonate minerals.
- Biologically formed and biologically induced carbonate precipitation.
- The oceanic carbonate system and preservation of deep-sea carbonates.
- Composition and source of shallow-water carbonate sediments

• Sestava in izvor plitvovodnih karbonatnih sedimentov. • Zgodnja diageneza. • Pokopna diageneza in metamorfoza. • $\delta^{13}C$, $\delta^{18}O$, $^{87}Sr/^{86}Sr$, sklopljeni izotopi, sledne prvine in elementi redkih zemelj (REE): indikatorji paleo-okolja ali/in diageneze. • Kratkoročni ogljikov cikel in vpliv človeka	• Early diagenesis. Burial diagenesis and metamorphosis. • $\delta^{13}C$, $\delta^{18}O$, $^{87}Sr/^{86}Sr$, clummped isotopes, trace elements and REE incorporation: paleoenvironmental vs. diagenetic proxies. • Short-term carbon cycle and human impact.

Temeljni literatura in viri / Readings:

Izbrana poglavja in članki/Selected chapters and papers

- Morse JW, Mackenzie FT (1990) *Geochemistry of sedimentary carbonates*. Elsevier, Amsterdam.
- Holland H, Turekian K, eds. (2014) *Treatise on Geochemistry*, izbrana poglavja iz Vol. 9: Sediments, Diagenesis and Sedimentary Rocks, in Vol. 7: Surface and Groundwater, Weathering and Soils.
- Morse JW, Arvidson RS, Luttge A (2007) Calcium carbonate formation and dissolution. *Chemical Reviews* 107: 342-381.
- Machel HG (2004) Concepts and models of dolomitization: a critical reappraisal. In: Braithwaite CJR, Rizzi G, Darke G (eds) The *Geometry and Petrogenesis of Dolomite Hydrocarbon Reservoirs*, Special Publication 235. Geological Society, London, 7-63.
- Swart PK (2015) The geochemistry of carbonate diagenesis: The past, present and future. *Sedimentology* 62:1233-1304
- Immenhauser A (2022) On the delimitation of the carbonate burial realm. *The Depositional Record* 8:524-574

Cilji in kompetence:	Objectives and competences:
Cilji Namen predmeta je poglobiti znanje o nastanku in diagenezi karbonatnih mineralov in sedimentov v različnih okoljih. Kompetence • Študentka oz. študent bo spoznal in znal uporabiti osnovne fizikalno-kemične zakonitosti, ki vplivajo na nastanek karbonatnih mineralov in sedimentov. • Pridobil bo pregled nad aktualnimi geokemijskimi indikatorji paleokolja in diageneze. • Znanje bo znal praktično uporabiti pri interpretaciji paleokolja in diageneze recentnih karbonatov in karbonatnih kamnin, nastalih v geološki preteklosti.	Objectives The purpose of the course is to deepen the knowledge on the occurrence and diagenesis of carbonate minerals and sediments in different environments. Competences • The student will learn and know how to use the basic physico-chemical principles which affect formation of carbonate minerals and sediments. • They will gain an overview of geochemical proxies currently in use for the reconstruction of past environmental and diagenetic conditions. • This knowledge enables interpretation of palaeoenvironment and diagenesis of modern carbonates and ancient carbonate rocks.

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje • Študentka oz. študent pozna vidike karbonatnih mineralov in njihovih interakcij z vodnimi raztopinami. • Loči nastanek primarnih karbonatnih mineralov in sedimentov v različnih okoljih od kasnejših diagenetskih in metamorfnih mineralov. • Za interpretacijo paleokolja nastanka karbonatnih kamnin in za ovrednotenje diageneze zna uporabiti številne geokemijske indikatorje. • Pri interpretaciji (paleo)okolja in sprememb na Zemljini površini zna opredeliti vlogo globalnega kroženje ogljika.	Knowledge and understanding • The student knows the basic aspects of carbonate minerals, and their interaction with the aqueous solution. • They differentiates between early carbonate precipitates in different surface environments from later diagenetic and metamorphic overprints. • In order to interpret the paleoenvironment of carbonate rock formation and assess the diagenetic overprints, they are able to use a wide range of geochemical proxies. • When interpreting the (paleo)environment and changes on the Earth's surface he/she is able to define the role of the global carbon cycle.

Metode poučevanja in učenja:	Learning and teaching methods:
☒Predavanja	☒Lectures
☒Laboratorijske vaje	☒Lab work/tutorials
☒Terensko delo	☒Field work
☒Seminar	☒Seminar
☒Individualne naloge	☒Independent work assignments
☒Konzultacije	☒Consultations
☒e-izobraževanje	☒e-Learning

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Daljši pisni izdelki	30	Long written assignments
Javni nastop ali predstavitev	20	Presentations
Končno ocenjevanje (pisni/ustni izpit)	50	Final examination (written/oral)

Reference nosilcev in soizvajalcev / Lecturers' references:

- Martín-Pérez A, La Iglesia Á, Almendros G, González-Pérez JA, Alonso-Zarza AM (2021) Precipitation of kerolite and sepiolite associated with Mg-rich carbonates in a cave environment. *Sedimentary Geology* 411:105793.
- Johnston VE, Košir A, Martín-Pérez A (2021). Evaluating carbonate dissolution and precipitation in a short time-frame using SEM: techniques and preliminary results from Postojna Cave, Slovenia. *Acta Karsologica* 50:253-267
- Johnston VE, Martín-Pérez A, Skok S, Mulec J (2021) Microbially-mediated carbonate dissolution and precipitation; towards a protocol for ex-situ, cave-analogue cultivation experiments. *International Journal of Speleology* 50:137–155
- Martín Pérez A, Martín García R, Alonso Zarza AM (2011) Diagenesis of a drapery speleothem from Castañar Cave: from dissolution to dolomitization. *International Journal of Speleology* 41:251-266

- Martín-García R, Alonso-Zarza AM, **Martín-Pérez A** (2009) Loss of primary texture and geochemical signatures in speleothems due to diagenesis: evidences from Castañar Cave, Spain. *Sedimentary geology* 221:141-9.
- Alonso-Zarza AM, **Martín-Pérez A** (2008) Dolomite in caves: Recent dolomite formation in oxic, non-sulfate environments. Castañar Cave, Spain. *Sedimentary Geology* 205:160-164.