

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: GEOLOGIJA KARBONATOV
Course title: CARBONATE GEOLOGY

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		
Environmental and Regional Studies, doctoral study 3 rd level	Palaeobiology and Sedimentary geology		

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

DIP06

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	30	30			180	9

Nosilec predmeta / Lecturer:

Doc. dr. Andrea Martín Pérez
(ostali izvajalci: izr. prof. dr. Martin Knez, izr. prof. dr. Nadja Zupan Hajna, dr. Bojan Otoničar)

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenščina, angleščina / Slovene, English

slovenščina, angleščina / Slovene, English

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

Prerequisite:

Vpis v 1. letnik

Inscription to the 1st academic year.

Vsebina:

Content (Syllabus outline):

- Uvod v karbonatne depozicijske sisteme
- Današnje karbonatne platforme in primerjava s karbonatnimi sistemi v geološki preteklosti
- Karbonatni sedimenti in komponente; klasifikacija apnencev in dolomitov
- Karbonatna okolja in faciesni mozaiki
- Karbonatni šelfi in rampe
- Karbonati, evaporiti in siliciklastiti
- Faciesi notranjih delov platform
- Grebeni in peščena telesa na robovih platform in na rampah

- Introduction to carbonate systems
- Modern carbonate platforms and comparison with ancient carbonate depositional systems
- Carbonate sediment components; limestone and dolomite classification
- Carbonate environments and facies mosaics
- Carbonate shelves and ramps
- Carbonates, evaporites and siliciclastics
- Platform interior carbonate facies
- Reefs and sandbodies on platform margins and ramps

<ul style="list-style-type: none"> ● Pobočni in pelagični karbonati ● Kontinentalni karbonati ● Sekvenčna stratigrafija ● Uvod v diagenozo ● Poroznost in zlog karbonatnih kamnin ● Diageneza apnenca, diagenetska okolja in evolucija poroznosti ● Dolomitizacija in dolomit ● Zakrasevanje karbonatnih kamnin ● Paleokras ● Sedimentologija karbonatnih rezervoarjev in vodonosnikov; ● Tektonika karbonatnih kamnin 	<ul style="list-style-type: none"> ● Slope and pelagic carbonates ● Continental carbonates ● Sequence stratigraphy ● Introduction to diagenesis ● Porosity and rock fabrics in carbonates ● Limestone diagenesis, diagenetic environments and porosity evolution ● Dolomitisation and dolostones ● Karstification of carbonate rocks ● Paleokarst ● Sedimentology of carbonate reservoirs and aquifers ● Tectonics of carbonate rocks
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Temeljni literatura in viri / Readings:

Izbrana poglavja in članki/Selected chapters and papers:

- Temeljni pregledni članki iz revij/fundamental reviews from journals *Earth-Science Reviews*, *Sedimentology*, *Sedimentary Geology*, *Journal of Sedimentary Research*.
- James, N.P. and Dalrymple, R.W., 2010: *Facies Models 4*, Geological Society of Canada, GeoText 6, 3, 323-586.
- Schlager, W., 2005: *Carbonate Sedimentology and Sequence Stratigraphy*, SEPM Concepts in Sedimentology and Paleontology, #8, 1-200.
- Tucker, M.E. & Wright, V.P., 1990: *Carbonate Sedimentology*.- Blackwell Scientific Publications, 1-482, Oxford.
- McIlreath, I.A. & Morrow, D.W., 1990: *Diagenesis*.- Geoscience Canada Reprint Series 4, Geological Association of Canada, 1-125; 277-316, Ottawa, Canada.
- Ford, D.C., Williams, P., 2007. *Karst Hydrogeology and Geomorphology*. John Wiley & Sons, Chichester, 1-102; 209-270; 321-400.
- Palmer, A.N., 2007. *Cave geology*. Cave Books, 1-454, Dayton, Ohio.

Cilji in kompetence:

Namen predmeta je osvojiti globlje, napredno znanje o geologiji sedimentnih karbonatov s končnim poudarkom na razumevanju razvoja poroznosti in uporabnih vidikov karbonatnih sedimentov. Predmet vodi študente od osnovnih konceptov in načel klasifikacije in terminologije prek geometrije in faciesne zgradbe karbonatnih platform do diagenoze (vključno z zakrasevanjem), poroznosti in tektonike. Dodaten poudarek se daje preteklemu (paleokras) in sedanjemu zakrasevanju karbonatov v Sloveniji in svetu. Predmet je preplet predavanj, študija terenskih primerov in laboratorijskih vaj z ustreznim materialom.

Objectives and competences:

The purpose of the course is to provide a deeper, advanced knowledge in geology of sedimentary carbonates with a final emphasis in porosity and applied aspects. It takes students from basic concepts and principles of classification and terminology through carbonate platform facies and geometries to diagenesis (including karstification), porosity evolution and tectonics. Additional emphasis is put on past (paleokarst) and recent karstification of carbonates worldwide and in Slovenia. Topic of the course will combine lectures, field examples and laboratory examination of the corresponding materials.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

Slušatelji se bodo naučili: razlikovati osnovne tipe geometrij karbonatnih platform in njihovo variabilnost; uporabljati koncept faciesnih modelov v različnih merilih – od zbruska do seizmične ločljivosti; razumeti primarne vidike depozicije karbonatov v prostoru in času; razumeti načine zakrasevanja ter vpliv litologije in klime; razločevati med primarno in sekundarno poroznostjo in razumeti procese razvoja poroznosti; razumeti procese in produkte dolomitizacije; povzeti glavne vidike geologije karbonatnih naftnih rezervoarjev in jih razlikovati od tistih, nastalih v klastičnih kamninah. Slušatelji bodo usposobljeni prepoznati vpliv značilnosti karbonatnih kamnin pri procesih zakrasevanja in oblikovanja površja.

Knowledge and understanding:

The students will learn to: distinguish the main types of carbonate platform geometries and their variability; operate with carbonate facies concepts and models on different scales – from thin section to seismic-scale; understand the primary controls on carbonate deposition in space and time; understand types of karstification based on lithology and climate; distinguish development of primary and secondary porosity in carbonate rocks; understand principles of dolomitisation processes and products; summarise the main aspects of carbonate reservoirs and compare them with those developed in siliciclastic rocks. They will be able to identify the influence of carbonate rocks characteristics in karst processes and landforms.

Metode poučevanja in učenja:

- predavanja
- e-učenje
- terenske vaje
- laboratorijske vaje: vzorci kamnin (jedra vrtin in dlančni vzorci), zbruski

Learning and teaching methods:

- Lectures
- e-learning
- Field work
- Laboratory: rocks in cores, hand samples and thin sections

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
● Pisni izpit	40	● Written exam
● Laboratorijske vaje	30	● Laboratory assignments
● Napisan članek/projekt	30	● Written paper/project

Reference nosilca / Lecturer's references:

Nosilka predmeta Doc. dr. Andrea Martín Pérez

1. Alonso-Zarza, A. M., Rodríguez-Berriguete, Á., Martín-Pérez, A., Martín-García, R., Menéndez, I., Mangas-Viñuela, J. 2020: Unravelling calcrete environmental controls in volcanic islands, Gran Canaria Island, Spain. *Palaeogeography, palaeoclimatology, palaeoecology*, 554, DOI: [10.1016/j.palaeo.2020.109797](https://doi.org/10.1016/j.palaeo.2020.109797).
2. Huerta, P., Martín-Pérez, A., Martín-García, R., Rodríguez-Berriguete, Á., La Iglesia Fernández, Á., Alonso-Zarza, A. M. 2019: Gypsum speleothems in lava tubes from Lanzarote (Canary Islands) : ion sources and pathways. *Sedimentary Geology*, 383, 136-147.
3. Huerta, P., Rodríguez-Berriguete, Á., Martín-García, R., Martín-Pérez, A., La Iglesia Fernández, Á., Alonso-Zarza, A.M., 201: The role of climate and aeolian dust input in calcrete formation in volcanic islands (Lanzarote and Fuerteventura, Spain). *Palaeogeography, Palaeoclimatology, Palaeoecology*, 417, 66-79.

4. Martín-Pérez, A., Košir, A. & Otoničar, B., 2015: Dolomite in speleothems of Snežna Jama, Slovenia: *Acta Carsologica*, 44, 81-100.
5. Alonso-Zarza, A.M., Meléndez, A., Martín-García, R., Herrero, M.J. & Martín-Pérez, A., 2012: Discriminating between tectonism and climate signatures in palustrine deposits: Lessons from the Miocene of the Teruel Graben, NE Spain: *Earth-Science Reviews*, 113, 141-160.

Reference ostali izvajalcev:

Izr. prof. dr. Martin Knez

1. Šegina, E., Benac, Č., Rubinić, J., Knez, M. 2018. Morphometric analyses of dolines : the problem of delineation and calculation of basic parameters. *Acta carsologica*, 47/1, 23-33. DOI: 10.3986/ac.v47i1.4941
2. Čeru, T., Šegina, E., Knez, M., Benac, Č., Gosar, A. 2018. Detecting and characterising unroofed caves by ground penetrating radar. *Geomorphology*, 303, 524-539. DOI: 10.1016/j.geomorph.2017.11.004.
3. Knez, M., Slabe, T., Urushibara-Yoshino, K. 2017. Lithology, rock relief and karstification of Minamidaito Island (Japan). *Acta carsologica*, 46/1, 47-62. DOI: 10.3986/ac.v46i1.2022.

Izr. prof. dr. Nadja Zupan Hajna

1. Zupan Hajna, N., Bosák, P., Pruner, P., Mihevc, A., Hercman, H., Horáček, I. 2020. Karst sediments in Slovenia: Plio-Quaternary multi-proxy records. *Quaternary international*, 546, 4-19. DOI: 10.1016/j.quaint.2019.11.010.
2. Lipar, M., Martín-Pérez, A., Tičar, J., Pavšek, M., Gabrovec, M., Hrvatin, M., Komac, B., Zorn, M., Zupan Hajna, N., Zhao, J., Ferk, M. 2020. Subglacial carbonate deposits as a potential proxy for glacier's existence. *The cryosphere discussions*. 30 apr. 2020, str. 1-22. DOI: 10.5194/tc-2020-82
3. Zupan Hajna, N., Otoničar, B., Pruner, P., Culiberg, M., Hlaváč, J., Mandić, O., Skála, R., Bosák, P. 2019. Late Pleistocene lacustrine sediments and their relation to red soils in the Northeastern margin of the Dinaric Karst. *Acta carsologica*, 48/2, 153-171. DOI: 10.3986/ac.v48i2.7080.

Dr. Bojan Otoničar

1. Zupan Hajna, N., Otoničar, B., Pruner, P., Culiberg, M., Hlaváč, J., Mandić, O., Skála, R., Bosák, P. 2019. Late Pleistocene lacustrine sediments and their relation to red soils in the Northeastern margin of the Dinaric Karst. *Acta carsologica*, 48/2, 153-171. DOI: 10.3986/ac.v48i2.7080.
2. Gabrovšek, F., Knez, M., Kogovšek, J., Mihevc, A., Otoničar, B., Mulec, J., Perne, M., Petrič, M., Pipan, T., Prelovšek, M., Slabe, T., Šebela, S., Ravbar, N., Zupan Hajna, N. 2016. Development challenges in karst regions : sustainable land use planning in the karst of Slovenia. V: Trofimova, E. (ur.), Salomon, J.-N. (ur.). *Preserving karst environments and karst caves : karst dynamics, environments, usage and restauration : towards an international karst preservation system.. Zeitschrift für Geomorphologie, Supplementband, N. F., 60/2, 293-318. DOI: 10.1127/zfg_suppl/2016/00309.*
3. Martín-Pérez, A., Košir, A., Otoničar, B. 2015. Dolomite in speleothems in Snežna jama Cave, Slovenia. *Acta carsologica*, 44/1, 81-100. DOI: 10.3986/ac.v44i1.1039.