



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2022/2023		
MASTER'S DEGREE (MSC)	GEORISK AND GEORESOURCES		
SUBJECT	VOLCANIC PETROLOGY WITH FIELD ACTIVITIES		
TYPE OF EDUCATIONAL ACTIVITY	C		
AMBIT	21015-Attività formative affini o integrative		
CODE	15310		
SCIENTIFIC SECTOR(S)	GEO/07		
HEAD PROFESSOR(S)	ROTOLO SILVIO GIUSEPPE	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	6		
INDIVIDUAL STUDY (Hrs)	86		
COURSE ACTIVITY (Hrs)	64		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	ROTOLO SILVIO GIUSEPPE Wednesday 12:30 14:30 Studio Prof. Rotolo Thursday 12:30 14:30 Studio Prof Rotolo		

DOCENTE: Prof. SILVIO GIUSEPPE ROTOLO

PREREQUISITES	The first lessons will refresh the basic needed petrographic concepts
LEARNING OUTCOMES	1) KNOWLEDGE AND UNDERSTANDING acquisition of necessary knowledge of geochemistry and petrology to develop an integrated view of magmatic rocks. 2) APPLYING KNOWLEDGE AND UNDERSTANDING. integrated perspective (observation-theory-eruptive scenario) for understanding petrology of volcanism either in the field or in lessons. 3) MAKING JUDGEMENTS Critical perspective and adoption of technical language. 4) COMMUNICATION SKILLS ability to explain geological implications and the connection between observations (micro and macroscopic) even to an audience without geological background. 5) LEARNING SKILLS ability to link in a unique mainframe theory, technology and practice
ASSESSMENT METHODS	- "in itinere" examination regarding the first part of the course (including the microscopic study of one of the thin section studied during the course. The more theoretical part (lectures) will be positively evaluated the ability to link arguments in a common mainframe. - final examination regarding the field campaign, related geological map and geological report. Will be positively evaluated the ability to link field data within an eruptive scenario. The minimum for the successful examination is: knowledge of the general outlines of the arguments of the course, and their interconnection. The higher the degree of interaction and fluidity of linkages among the arguments of the course, the increasingly higher positive evaluation.
EDUCATIONAL OBJECTIVES	The principal educational aims of the course are: 1) acquisition of an integrated perspective of the study of volcanic rocks, using the methods of experimental petrology, microscopic petrography, geochemistry, volcanology. With applications of innovative microanalytical devices (FT-IR). Adequate technical language, and own elaboration of working hypotheses with personality, but supported with robust arguments. 2) Development of adequate field skill necessary to translate the field successions of pyroclastic deposits in an eruptive scenario. In detail: (i) familiarity with effusive and pyroclastic rocks; (ii) petrography and eruptive dynamics; (iii) eruptive typologies; (iv) volcanostratigraphy; (v) evaluation of volcanic hazard.
TEACHING METHODS	- lectures, - 4-5 days field campaign at Pantelleria island
SUGGESTED BIBLIOGRAPHY	Il corso è nato (AA 1999-2000) e si è sviluppato sulla base delle (i) più recenti acquisizioni di petrologia del magmatico (per massima parte contenuta in una vasta letteratura di articoli scientifici) e (ii) dalle esperienze di ricerca del Docente. Pertanto non esiste un testo consigliato, bensì i file pdf delle lezioni forniti dal Docente e gli appunti delle lezioni stesse. Si sottolinea l'importanza della frequenza. Argomento centrale del corso è il campo plurigiornaliero a Pantelleria centrato sulla geologia di: ignimbriti, caldere e eruzioni esplosive a minore energia, lave e duomi.

SYLLABUS

Hrs	Frontal teaching
2	Upper and lower mantle: the fate of subducted slab. Petrological and geochemical aspects of mantle-derived magmas. Partial melting of lherzolite: basalts, picrites, komatiites. Primary and derivative magmas.
3	Mechanisms of experimental petrology for high pressure experiments (piston-cylinder, multi-anvil, diamond anvil cell). The experimental strategy to carry out an experiment focused onto determination of the wet lherzolite solidus.
1	Structure of silicate melts: the NBO/T ratio. Influence of cationic species on magma rheology. Glass transition T.
1	Volatiles in magmas. Solubility models for H ₂ O and CO ₂ . The role of fO ₂ on crystallization. Inferences on minerals stability, ascent-related crystallization.
3	Principles of FT-IR Spectroscopy. The study of melt inclusions, theory and practice (optical microscopy). FT-IR spectroscopy: theory and practical applications (analysis and FT-IR spectrum interpretation). From spectrum to volatiles concentrations. From volatiles to entrapment pressure: tracking magma pathways.
1	Review of trace elements and their application in petrogenetic models or characterization of magma sources.

SYLLABUS

Hrs	Frontal teaching
2	Petrological applications of Rb/Sr and Sm/Nd isotope systematics. The mantle array, enriched and depleted mantle.
2	Pb/Pb isotopic system. Mantle geodynamics and mantle isotopic reservoirs (DM, EMI, EMII, HIMU). African, tyrrhenian and aeolian mantles. Applications to Plio-Quaternary magmatism around Sicily.
2	The H ₂ O transport in the deep mantle (DHMS minerals). Nominally anhydrous minerals. Implications for subduction zone magmatism.
2	Plio-Quaternary magmatism in central and southern Italy.
3	Magmatism in Aeolian Islands: petrological, geochemical and volcanological characterization. MANTle sources. primitive and evolved magmas. Relationships between tectonics and magma types.
3	Volcanological history of Stromboli island. Petrological characterization of mantle sources and of Stromboli magmas. Primitive magmas erupted during eruptive paroxysm. The contribution of experimental petrology on tracking residence and ascent.
1	Hyblean magmas, petrology and volcanological outlines. Mantle xenoliths.
3	Mt. Etna volcanological history. Characterization of mantle sources and petrological characterization of erupted magmas. Aphiric magmas. Picritic magmas and plinian basaltic eruptions.
2	Sicily Channel, submarine volcanism. Pantelleria and its amazing volcanological history; Pantellerite magmas: petrogenesis and peculiarities. Study in thin section of some key pantellerite/trachyte eruptions (ignimbrites, pumices, lavas).
1	Review of methods of study of pyroclastic deposits, preliminar to the field work at Pantelleria.
Hrs	Others
32	4-days field work at Pantelleria island (on the basis of financial support by the Faculty), focused on the study of explosive volcanism, ability to transalte an eruptive sequance in a volcanological and petrological scenario. In detail: study of ignimbrites, eruptive waxing and waning phases, quiescence. Fallout deposits. Lavas and domes. Deposits tied to caldera collapses. Rheomorphism, ductlle deformations and emplacement dynamics of ignimbrites. Geological mapping stratigraphy, stratigraphic correlations, considerations upon eruptive scenarios and related volcanic hazard.