



Dipartimento di Scienze e Tecnologie

ACADEMIC YEAR 2017/2018

DEGREE COURSE in Geological Sciences
TEACHING of GEOMORPHOLOGY

TEACHER: Prof. Filippo RUSSO

COURSE PROGRAM of GEOMORPHOLOGY
Second year - second semester

Introduction

Purposes and methods of Geomorphology; relationships between Geomorphology and other Earth Sciences. Morphogenesis concept and meaning: morphogenetic agents and processes; morphogenesis factors. Concept and significance of the Relief energy and Base level.

The genesis and evolution models of the relief

The davisian concept of Erosion cycle. Characteristics and significance of the morpho-evolutionary stages of the relief in the Davis cycle. The regular profile of the slopes and streams and the variations of the shape of the relief in the Davis cycle. Peneplains and residual reliefs. Time, tectonic and climatic factors in the morphogenesis of the Davis relief. Limits of application of the Davis model. The cyclicity in evolution of the relief: polycyclic and polyphasic morphogenesis. Morphogenetic significance of the orogenic bands and cratonic shields. The other geomorphological models of evolution of the relief.

The denudation processes of the relief

Role of the processes of weathering/alteration in morphogenesis and evolution of relief. Factors of weathering and classification. Physical weathering: processes, products and morphogenesis; frost action and thermoclastism. Chemical and biological weathering: processes, products and morphogenesis. Examples and forms of rock-degradation and crushing. The spheroidal weathering. Peltier's diagrams of alteration processes in relation to the main climatic factors.

Relationship between rock weathering and pedogenesis: alteration as a fundamental process of pedogenesis. Distinction between alterites, regolite and soil. Development and characteristics of the alteration profile.

Soil properties: the pedological profile and the horizons. Meaning of some soil properties in relation to genesis, evolution and workability: color, structure and texture, bases content. The anthropogenic factor in the development of pedogenesis: The issue of global soil erosion. Factors of pedogenesis. Role of climate and organisms in the development of pedogenesis. The classification of soils. Soils and geomorphic environments. Pedogenetic regimes and their main characteristics.

The karst morphogenesis

The process of karst dissolution and the chemical-physical aspects that characterize it. Relations between chemical mixing and hypogeum karst. Role and importance of karst in the morphogenesis of relief. Genesis and classification of free and buried karst microforms: karren, karrenfeld, wells, etc. The epigean karst macroforms: genesis and evolution of dolines and swallows. Genesis and classification of dolines, uvalas, karstic valleys and poljes. The most common forms carbonate precipitation: the travertines. The Civijc regression. Lithological and tectonic control over the genesis of epigean karst macroforms. The hypogeous karst and the factors controlling its development. Morphogenetic characteristics of hypogeous landforms. Hypogeum hydrological zoning of a karstic massif. Paleokarst. Speleogenesis and

Speleothemes. Relationships between epigean and hypogean karstic forms. The inverse erosion process. Meaning morphotectonic and paleo-environmental of karst morphogenesis. Geomorphological aspects of the karstic landscapes of the Southern Apennines.

The glacial and periglacial morphogenesis

Morphogenetic action of the ice. Morphologic characteristics of a glacial landscape. Classification of glaciers. Factors affecting glacial morphogenesis. The glacial environment landforms. Zoning and budgeting of a glacier. Glacial transport. Fluvio-glacial, glacio-lacustrine and glacio-marine environments. Chronological significance of varved deposits; Morphoclimatic meaning of glacial landforms in the history of modeling the relief.

Permafrost and periglacial environment. Processes and main landforms of the periglacial environment.

The water as a morphogenetic agent

Water as a morphogenetic agent. Relationships between rainfall, infiltration and surface run-off in various environmental and soil conditions. Factors affecting the sheet wash and infiltration. The erosive action of water: the splash erosion. The sloping of the hillslopes and the morphogenetic effects: The hydrographic network and the energy sizing of the linear incisions on the hillslopes. Physical parameters of a river channel. The law of continuity and its applications. Relationship between the physical and morphological parameters of a river channel: the Chezy laws. The pattern of river channels and factors influencing it: Schumm and Meyer's (1979) diagram. Relationship between current velocity and erosive power: the Hjulstroem diagram. Relationship between current velocity and transport capacity: the Sundborg diagram. The Time of Running water: significance and application of the Giandotti Formula. Geomorphological meaning of flood. Relationships between solid and liquid discharges: the Lane equation. Role of slope and granulometric dimension in The Lane equation. Causes of river aggradation and degradation. Main morphological elements of braided, meandriform and straight rivers. Alluvial fans and deltas. Schematization of the morphological elements of an alluvial plain. Fluvial and alluvial morphogenesis: calanchi and biancane, earth pyramids. River terraces: genesis and classification.

The hillslope morphogenesis

Types of erosive processes acting on the hillslopes: linear, areal and punctual erosion. Processes and landforms of areal erosion: speed profiles in slow movements of the regolite. Soil creep, solifluxion, rock glaciers, sheet flow. Role of water and slope in slow motion of the regolite. Carson and Kirkby's diagram of landforms, processes and mass movements on the hillslopes. Processes and landforms as a punctual erosion: the landslides. Geomorphological scheme of a landslide. Types of landslides and classification. Scharpe diagram of mass-wasting types. Geomorphological significance of the slope movements and related landforms in the study of the relief modelling.

Climatic geomorphology

Relationships between climate factors and morphogenesis. Meaning of morphogenetic region and geomorphic system. Relations between climatic parameters and morphogenetic agents (running water, wind, mass movements on the slopes): Peltier diagrams.

Genesis and evolution of the shape of the slopes and the natural scarps

The morphogenesis of landscapes and the evolution of the slopes: a comparison between Davis and Penck and King's models. The morphogenesis of slopes and scarps: the Wood model and the development of the washing slopes. Slopes and fault scarps. The Lehmann's model of evolution of the shape of the slopes: limits and applications. Morphogenetic significance of C factor in the Lehmann model and abnormal cases. Examples of Apennine fault scarps whose morphogenesis can be traced back to the Lehmann



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model. The fault line scarps: cases of morphological convergence in the evolution of tectonic landscapes. Apennine examples of fault line scarps. The inversion of the relief and the role of morphoselection.

During the course, practical exercises will be carried out on the macroscopic recognition of the main landforms of the relief through the use of illustrations and field excursions.

Reference textbooks

CICCACCI – Le forme del rilievo. Atlante illustrato di Geomorfologia - Mondadori/Università

BARTOLINI - PECCERILLO – I fattori geologici delle forme del rilievo – Pitagora Ed.

BLOOM – Geomorphology – Prentice-Hall Eds.

CASTIGLIONI - Geomorfologia – Ed. UTET.

PANIZZA - Geomorfologia – Pitagora Ed.

DRAMIS – OLLIER – Genesi ed evoluzione del rilievo terrestre - Pitagora Ed.