Congresso

XX ABEQUA

QUATERNÁRIO: INTERCONEXÕES COM USO DOS RECURSOS NATURAIS

ABSTRACTS

ORAL SESSION

The present and future of the Anthropocene in the heart of the Amazon

16 September 2025, Macapá, Amapá, Brazil

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[Plenary talk]

Introduction to UNESCO IGCP 732 LANGUAGE of the Anthropocene and the International Geoscience Program

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Abstract: UNESCO IGCP 732: LANGUAGE of the Anthropocene (Lessons in Anthropogenic Impact: A Knowledge Network of Geological Signals to Unite and Assess Global Evidence of the Anthropocene) is an International Geoscience Programme (IGCP) project approved in 2021 and set to run through 2026. The IGCP, formerly the International Geological Correlation Project, has facilitated international scientific collaboration in the geosciences since 1972, with a particular emphasis on the inclusion of researchers from developing and less developed countries. IGCP 732 addresses the Anthropocene as a defining concept of contemporary and future geology, recognizing the profound and accelerating impact of human activity on Earth systems. The project aims to synthesize global geological evidence of the Anthropocene and promote its use as a unifying and forward-looking framework for geoscience research. Through the development of a global network of scientists and institutions, IGCP 732 supports collaborative research, fieldwork, and annual meetings, which have included events in Austria (2021, online kick-off meeting), Kenya (2022), China (2023), and the Republic of Korea (2024). So far, 139 scientists from 30 countries have joined our network and participated in the annual meetings. The 2025 meeting is scheduled in Brazil, bringing the project into dialogue with the Brazilian Quaternary science community and the Amazon region. Active subprojects within the IGCP 732 framework include the Austrian Academy of Sciences funded project on recent lake sediments from Pakistan, Austria and Kenya, a Brazilian project on correlating urban anthropogenic sediments of Vienna and Brazilian cities, cooperation project of the Republic of Korea and Austria on the Holocene-Anthropocene transformation on the west coast of Korea and the Japan Trench and collaboration between Austria, China and Pakistan on Comparative Study on the Eurasian Record of Anthropocene Radioactive Markers. Cooperation was also established with geoparks in Austria, China and the Republic of Korea, and potential geopark areas in Kenya. By building a global knowledge framework, IGCP 732 seeks to foster inclusive scientific engagement and to shape the future trajectory of geoscience in the Anthropocene.

Keywords: Anthropocene, IGCP 732, International Geoscience Program, Anthropocene network, Human impact, Earth systems

Presentation model: ( ) Poster (x) Oral

[Keynote]

GEOLOGICAL EVIDENCE FOR A CHRONOSTRATIGRAPHIC ANTHROPOCENE

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Abstract: The Anthropocene, as used in its original formulation as a designation of time, reflects irreversible changes in Earth System functioning. We show that these changes are expressed as multiple distinctive geological signals, which can help inform the utility of this concept across many fields of scholarship. We synthesize the stratigraphic evidence for a proposal to define the Anthropocene as an epoch of the Geological Time Scale, nominally commencing on 31st October 1952 19:15 UTC with the first thermonuclear detonation. A marked upturn in plutonium isotopes globally forms the primary marker, including the chosen Global boundary Stratotype Section and Point (GSSP) at Crawford Lake, Canada. Our multi-proxy analysis of 12 stratigraphic records worldwide, present in marine and lake sediments, a peat, corals, ice core, a speleothem and urban deposits, provides a permanent record of the exceptional magnitude, rate, significance and novelty of planetary change across the mid-20th century. Many of the signatures that occur well beyond typical Holocene ranges are caused by anthropogenic drivers, such as burning fossil fuels and modifying biodiversity. Annual to sub-annual stratigraphic resolution permits correlation of proxy signals of this planetary change with unprecedented precision. Our results establish a foundation for precisely defining the Anthropocene, and for extending its understanding to new environments and geographical regions.

Keywords: Anthropocene, geological archives, Global boundary Stratotype Section and Point, synchronous signals

Acknowledgements: The analysis of the 12 sites was facilitated by a collaborative research project between numerous research laboratories and the Anthropocene Working Group (AWG) to define the stratigraphic Anthropocene. We gratefully acknowledge the Haus der Kulturen der Welt (HKW, Berlin) for its support and collaboration, realised in the framework of HKW's long-term initiative Anthropocene Curriculum, an international project for experimental forms of Anthropocene research and education developed by HKW and the Max Planck Institute for the History of Science (MPIWG, Berlin) since 2013.

Presentation model: ( ) Poster (x) Oral

Stratigraphic signals for the Anthropocene: markers, events, spikes

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Abstract:
Signals and markers that were proposed by the Anthropocene Working Group (AWG) to define the Anthropocene around 1950 include the primary markers of the radionuclides of atmospheric bomb test fallout such as plutonium, americium, neptunium and C-14 (e.g. 239Pu, 237Np). Secondary markers are provided by spheroidal carbonaceous particles (SCPs), linked to industrial processes such as high-temperature fossil fuel combustion. Examining the usability, durability and preservation potential of such Anthropocene boundary markers in future geologic strata over millennia and millions of years includes testing against evidence from recent and deep time analogues. The good preservation potential of environments such as inland deserts, transgressive coasts and fine-grained deep-water pelagic sedimentation foster the formation of anthropogenic technofossil-Lagerstätten such as landfills and marine waste mass-flows. Together with stable isotope markers such as carbon and anthropogenic contamination by trace metals such as lead, artificial radionuclides and flyash components give a distinctive fingerprint to Anthropocene strata..

Keywords: Anthropocene, plutonium, technofossils, Lagerstätte.
Acknowledgements: UNESCO IGCP 732 supported

Presentation model: ( ) Poster (**X online) Oral**

TRACING ANTHROPOCENE SIGNATURES IN THE COASTAL STRATIGRAPHY AND SEDIMENTARY PROCESSES OF STRAND-PLAINS: A CASE FROM BALIKPAPAN'S EASTERN SHORELINE, INDONESIA

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Abstract: The Anthropocene's stratigraphic signatures in coastal zones are increasingly discernible through human-altered sedimentary processes, as demonstrated by Balikpapan's eastern shoreline in Indonesia. This study investigates the presence and characteristics of Anthropocene signatures within the coastal stratigraphy and sedimentary processes of the strand-plain system along the eastern shoreline of Balikpapan. The region represents a dynamic coastal environment shaped by the interplay of fluvial, marine, and increasingly anthropogenic forces such as urban expansion, industrial development, and port construction. Utilizing a combination of sediment core analysis, stratigraphic profiling, granulometric studies, and geospatial data interpretation. A total of five sediment cores (ranging from 1.5 to 3 meters in depth) were extracted along a transect from the active shoreline to the backshore zone. Granulometric analysis revealed a shift from well-sorted fine sands in the basal layers typical of natural strand-plain deposition to more poorly sorted, silty-sand and anthropogenically altered sediments in the upper strata. Notably, the upper 50–70 cm of the cores contain increased concentrations of microplastics, metal fragments, charcoal, and construction debris. X-ray fluorescence (XRF) and loss-on-ignition (LOI) analyses further confirmed elevated levels of heavy metals (Pb, Zn, and Cu), and organic carbon loss indicative of urban runoff and industrial discharges. Satellite imagery from 1985 to 2023, overlaid with GIS-based shoreline change analysis, documented an average seaward advancement of 22.4 meters, largely driven by reclamation activities and altered riverine sediment inputs. The integration of sedimentological and geochemical proxies underscores a definitive Anthropocene imprint, distinct from natural Holocene variability, driven by industrial and urban interventions.

Keywords: Anthropocene; Balikpapan, East Kalimantan; Human impact; Coastal stratigraphy; Sedimentary processes; Strand-plain.

Acknowledgements: The authors gratefully acknowledge the support provided by the UNESCO International Geoscience Programme (IGCP) Project 732 and the Austrian Academy of Sciences, International Programs.

Presentation model: ( ) Poster (X) Oral

Reconstructing atmospheric ^{129}I deposition over 170 years with the varved sediment in the Sihailongwan Maar Lake, northeast China

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Abstract: Long-term deposition of atmospheric radioactive iodine-129 (^{129}I) is important for assessing the impact of human nuclear activities (HNAs), but still not well understood in East Asia. In this study, we quantitatively reconstructed the deposition history of airborne ^{129}I using varved sediment from Sihailongwan Maar Lake (SHLW) in northeast China. Our results revealed significant increases in ^{129}I concentrations and ^{129}I/^{127}I atomic ratios since the 1950s, indicating the influence of HNAs on the environment and marking the onset of the Anthropocene. The variation of ^{129}I in the investigated site can be primarily attributed to the global fallout of ANWT as well as nuclear fuel reprocessing in Europe, Russia and the USA. Notably, neither the Chernobyl nor the Fukushima nuclear accidents have had any discernable impact on the SHLW Lake. Over the past 170 years (1846 - 2021), the reconstructed fluxes indicate a rapid increase in ^{129}I deposition from the early 1950s until the 1970s followed by dramatic changes thereafter. The measured ^{129}I in the SHLW Lake fluxes range between (1.26 - 349) × 10^9 atoms m^{-2} yr^{-1}, which are consistent with similar latitude zones across East Asia. However, significant differences exist when

compared to the values observed in high-elevation glaciers within the Northern Hemisphere. The discrepancy is attributed to the prevailing atmospheric circulation patterns. The total ^{129}I inventory was calculated to be 11.9×10^{12} atoms m^{-2}, with natural and anthropogenic ^{129}I accounting for 2.86 % and 97.1%, respectively, suggesting an overwhelming artificial contribution. The reconstructed fluxes and inventory of atmospheric ^{129}I deposition quantitatively distinguish the natural and artificial contributions, and provide a novel insight into the historical environmental impact of HNAs in East Asia and the characteristics of the Anthropocene.

Keywords: Iodine-129; Atmospheric deposition; Sihailongwan Maar Lake sediment; Quantitative reconstruction; The Anthropocene.

Acknowledgment: This work was supported by the National Natural Science Foundation of China (No. 41991250 and 42177095), the West Light Foundation of CAS (XAB2020YN02), the UNESCO IGCP 732 project, the Youth Innovation Promotion Association (2019401) and the Strategic Priority Research Program (Grant No. XDB40000000) of Chinese Academy of Sciences. The authors sincerely appreciate the anonymous reviewers for their valuable and constructive comments and the staff for their great effort in sediment collection.

Presentation model: (√) Poster ( ) Oral

Synchronizing Pu fallout and Inorganic Fly Ash Particles record in Northern Hemisphere peatlands

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Abstract: Two critical markers of anthropogenic activity – plutonium (Pu) and inorganic fly ash particles, specifically spheroidal aluminosilicates (SAPs) and mullite – to evaluate their patterns of distribution across the Northern Hemisphere in 6 peat profiles and compared with published data. Measurements of ^{210}Po and $^{238,\ 239+240}$Pu activities were carried out using an alpha-ray spectrometer (AlphaAnalyst 7200, Mirion Technologies) equipped with semiconductor, passivated planar silicon detectors (PIPS, Mirion Technologies). The nomenclature and formulation used for age reconstructions were based on both the CF/CS and CRS strategies. The inorganic particles in peat samples were analyzed using a scanning electron microscope (SEM-FEI Quanta 250) equipped with an energy-dispersive X-ray analyzing (EDS) system.

The global Pu fallout record is synchronous within the time uncertainties, but shows differences in maximum activity concentration and calculated inventories. Higher inventories were recorded in Iceland, at Śnieżka and the Izery Mountains in Poland, as well as in Tomsk, Siberia, Russia (88.63–104.58 Bq m^{-2}).

SAPs and crystalline mullite, byproducts of high-temperature coal combustion released into the atmosphere, first appeared during the mid-20th century industrial expansion, corresponding to the onset of the so-called Great Acceleration Event Array in remote regions like Spitsbergen and China, whereas in areas proximal to emission sources it is characterized by a pronounced and rapid increase. SAPs exhibit notable size variability, ranging from <2-5µm in remote locations like Iceland, Spitsbergen, and mountainous regions of Northern China to <2-80µm in peatlands close to industrial centres. This size distribution reflects the relationship between the distance (vertical and horizontal) from SAP emission sources and their deposition in peatlands. Despite differences in transport mechanisms and deposition pathways,

both plutonium and SAPs provide distinct, globally recognizable markers of the Anthropocene.

Keywords: Plutonium, SAP, atmosphere, deposition, coal

Acknowledgements: The research was funded by grant no. 2017/27/B/ST10/00428 from National Science Centre, Poland, as well as supported by IGCP 732 - LANGUAGE of Anthropocene.

Presentation model: ( ) Poster (X) Oral

Nature-based solutions for alleviating aeolian hazards in coastal zone under marine spatial planning strategy: Lessons from the Xiasha Beach Resort, China

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Abstract:
Marine spatial planning (MSP) represents a critical tool for the worldwide design of coastal development and protection strategies. Marine Functional Zoning (MFZ) served as a cornerstone for the country's coastal economic and environmental development in China. Despite its significance, limited studies have presented the local application of MSP policies upon tourism exploitation in coastal regions. This paper fills this research gap by thoroughly examining the operational mechanisms of these strategies. The analysis focuses on the Xiasha Beach Resort, a case study exemplifying the coordinated efforts required among governments, scientists, and the public for the successful implementation of MFZ policy. Findings from the Xiasha Beach Resort presents a shift from hard seawall structures towards nature-based alternatives to reshape beach-dune morphology and alleviate aeolian hazards, the importance of tourism market management, and a high degree of collaboration among key stakeholders. Furthermore, the study emphasizes the importance of ecosystem-based restoration technology that maintains the integrity of the beach-dune system, fosters diverse vegetation, and encourages adaptive measures such as environmental capacity control. The sustainability of the MSP approach hinges on wide and diverse public participation, as national MSP policies foster trust, credit, and feedback from local citizens, promoting necessary policy adjustments. In conclusion, this study offers valuable insights for coastal regions to achieve high-quality coastal economic development and environmental protection targets.

Keywords: MSP, Nature-based solutions (NbS), Coastal ecological restoration, Coastal tourism, Public participation.
Acknowledgements: If any.

Presentation model: ( ) Poster (√ online) Oral

Anthropogenic fingerprint of the Urban Anthropocene at Karlsplatz (Vienna, Austria)

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Abstract:
Urban anthropogenic strata have only limited lateral continuity, highly variable deposition rates, are prone to (anthropogenic) erosion, reworking and resedimentation, and show omission surfaces. In Vienna (Austria) an archaeological excavation site near the city centre and the Wien River displayed a section from natural flood sediments of the 17th century to anthropogenic fill to the latest levelling period at the 1950s. Archaeological stratigraphy and historic data sets provide age constraints for the multiple deposition phases, with the oldest road structures dating from the 18th century and the youngest deposits dating around 1922, post-1945 and the park opening in 1959. Atmospheric bomb-testing fallout plutonium was used for further Anthropocene age constraints (Wagreich et al., 2023) dating the upper layer as deposited between 1952 and 1959. The fine-grained matrix (< 2 mm grain size) of the deposits was used forXRF analysis of trace elements such as lead, copper and zinc. The highest levels of trace metals are present in sediments of a 19thcentury deposit rich in charcoal and metal slags associated with nearby metal-working industry. The second highest peak occurs in a layer of WW2 rubble rich in technofossils of that era. Overlying deposits of the 1950s show again much lower values similar to the range of low contamination background and infill materials. compared to the 1950s. Spheroidal carbonaceous fly-ash particles (SCPs) were found in elevated concentrations in the post-1945 levels. These results indicate both a local (iron industry of the 19th century, WW2 pollution) and a regional global control on trace metal and fly ash contamination and a correlation with technofossil findings. Various proxy signals provide an anthropogenic fingerprint and stratigraphic markers in this urban stratigraphic reference section for the Anthropocene.

Wagreich et al., 2023. The Anthropocene Review, 2023, 10/1, 316-329. doi 10.1177/20530196221136427

Keywords: Anthropocene, plutonium, contamination, stratigraphy.
Acknowledgements: UNESCO IGCP 732 supported

Presentation model: ( ) Poster (**X online) Oral**

THE CONCEPT OF THE ANTHROPOCENE IN QUATERNARY STUDIES: WHAT, AFTER ALL, IS IMPORTANT TO RESEARCH?

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Since the term Anthropocene was coined 25 years ago, multiple approaches have been taken to the subject, to the point that it has extended beyond the geological context, coupled with substantial media coverage, which has contributed to the entrenchment of the term within the public discourse. Although the concept of the Anthropocene originated within the Earth Sciences — particularly in relation to the study of the global environment— it has since permeated virtually all domains of human knowledge, including culture, art, and philosophy. This framework implies that any research conducted today would fall under the scope of the Anthropocene, raising the question of how to assign identity and value to studies on the subject. This issue is all the more important given that, in March 2024, the International Commission on Stratigraphy rejected the proposal to formally recognize the Anthropocene as a chronostratigraphic unit. However, research on the Anthropocene within the Earth Sciences — particularly in Quaternary Studies — is invaluable to science, as it is based on the premise that humanity has become a geological agent. We live in a time in which the profound impacts of human activities on the planet are becoming increasingly evident, necessitating a deeper understanding of these interrelationships. In this context, it could be proposed that the primary research areas be categorized as follows: (1) geological and geomorphological analysis of technogenic ground (e.g., formation processes, classification, stratigraphy, geotechnics); (2) diagnosis of anthropogenic environmental alterations (case studies); (3) study and enhancement of markers identification to detect human geological agency (e.g. isotopes, microplastics); (4) reconstructing environmental histories; (5) scientific foundations for land-use planning; (6) scientific bases for preventive and conservation strategies, adaptation to environmental changes and public policy development. These studies foster philosophical and ethical reflections that converge to emphasize the responsibility of researchers as participants in the main geological agency in the current transformation of the planet's surface.

Keywords: research, Anthropocene, human geological agency, Quaternary

Presentation ( ) Poster (X) Oral

AGRICULTURAL SOILS IN THE ANTHROPOCENE: SOIL ORGANISMS AS SENTINELS OF ENVIRONMENTAL QUALITY

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Abstract: The intensification of land use in the context of the Anthropocene has posed significant challenges to maintaining environmental health, particularly in highly productive agricultural areas. The pressure to increase yields, combined with intensive management practices, compromises soil biodiversity and can trigger degradation processes that are difficult to reverse. In this context, monitoring soil organisms emerges as an important tool for assessing environmental quality.

This study investigates soil quality in vineyards in California, USA, by analyzing microarthropods (mites and springtails), which serve as bioindicators of ecotoxicological stress. Soil samples were collected from various vineyards, encompassing areas with diverse management practices, ranging from conventional systems to more conservation-oriented approaches. Organisms were extracted in the laboratory using a high-gradient MACFADYEN extractor, followed by counting, sorting, and identification of the main microarthropod groups. Based on the collected data, patterns of abundance, diversity, and community composition are being analyzed to explore possible relationships between agricultural management practices and soil biological quality.

Preliminary results indicate variations in the diversity and abundance of organisms among the studied areas; however, the direct influence of management practices remains to be evaluated. Ongoing analysis will be essential to better understand the impact of different agricultural systems on soil biodiversity.

This work aims to contribute to the discussion on agricultural sustainability in the Anthropocene, highlighting the importance of soil as a living and vulnerable environment. By integrating biological indicators into environmental monitoring, the study seeks to provide insights for more sustainable agricultural practices and the preservation of soil biodiversity in agricultural ecosystems.

Keywords: bioindicators; vineyards; California.

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without which this research would not have been possible: FCT/UNESP and UC Davis.

FORMATION OF A TECHNOGENIC PLAIN AT A DRAINAGE HEADWATER IN A RURAL AREA OF PRESIDENTE PRUDENTE, SÃO PAULO: INSIGHTS FROM THE PERSPECTIVE OF THE ANTHROPOCENE

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Abstract:
Anthropogenic actions on landforms—such as deforestation, pollution, mining, and construction—have over time led to significant transformations in natural dynamics, leaving visible imprints on the Earth's surface. Within this context, the concept of the Anthropocene emerges, wherein humans are regarded as geological agents capable of profoundly and enduringly altering the physical environment. Technogenic grounds constitute one such manifestation, with particular emphasis here on those originating from technogenic deposits. These are composed of materials transported or remobilized through human activities, such as waste and rock fragments, which modify the landscape and play a crucial role in understanding contemporary geomorphological and pedological processes in the areas where they are found. Internationally, this subject has been under investigation since the 1980s, while in Brazil, pioneering studies began to appear in the 1990s. The present study was conducted on a rural property in the municipality of Presidente Prudente, São Paulo State, where an alluvial plain modified by anthropogenic interventions was identified. Satellite imagery and aerial photographs from different time periods were analyzed, and fieldwork included augering, trench excavation, and borehole sampling to collect sediment samples. In the laboratory, granulometric analysis, bulk density measurements, particle-size fractionation, and stereoscopic examination were performed. The results indicated the presence of remobilized sandstone fragments, technofossils such as plastic debris and construction waste, and evidence of soil compaction. Granulometric analysis revealed a predominance of sandy textures, consistent with the local lithology (Adamantina Formation sandstones). Microplastics and charcoal fragments were observed in multiple layers under stereoscopic magnification, suggesting a progressive accumulation of anthropogenic materials over several decades, likely influenced by erosion processes and waste disposal in adjacent areas, particularly along the rural road located upstream of the plain. An aerial photograph further indicated that the current technogenic plain was originally a fluvial plain. The original watercourse was subject to siltation and morphological

alterations, resulting in its present configuration, classified as an aggraded technogenic ground. This ground comprises technogenic deposits with stratified *spolic* material overlaying potentially natural sediments deposited in earlier periods, thus characterizing a rural technogenic floodplain environment.

Keywords: Anthropocene; Technogenic Grounds; Technogenic Landforms.

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Presentation: ( ) Poster (X) Oral

A POLUIÇÃO (in)VISÍVEL DO PLÁSTICO NA AMAZÔNIA COSTEIRA

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Resumo: A produção global de plástico ultrapassa 400 milhões de toneladas anuais. Na Amazônia Costeira, especialmente no Amapá, estudos apontam que a Poluição Plástica-PP compromete a biota, os recursos hídricos e a litosfera. Este trabalho objetiva descrever as evidências visuais da PP na Zona Costeira do Amapá, além de quantificar e analisar microplásticos-MPs em sedimentos do estuário do rio Amazonas, destacando fontes e impactos locais. O estudo foi realizado na região estuarina dos rios Amazonas, Cuñani, Calçoene e na Estação Ecológica de Maracá-Jipioca/ESECMJ. Para a análise visual foram realizadas observações diretas e registro fotográfico, enquanto para a análise de microplástico foram coletadas quatro amostras de sedimentos com uma draga do tipo *Van Veen* e submetidas à análise por espectroscopia de energia dispersiva de raios-X (EDS). A análise visual revelou que em regiões estuarinas, a maior concentração de resíduos fica próximo a áreas urbanizadas, correlacionando densidade populacional e poluição visual**.** Contudo, no setor de Macapá/Santana foi observado acúmulo crítico de poluição plástica, com muitas sacolas presas em árvores e sedimentos estuarinos com resíduos urbanos e contaminação por microplástico em todas as amostras coletadas. A ilha de Maracá, apesar de protegida, apresentou poluição por pesca fantasma com cordas de nylon em ninhos de aves e boias à deriva. Os resultados de EDS confirmam a poluição por MPS (100% das amostras) com presença de aditivos antioxidantes, inorgânicos usados para pigmentação e para resistência física na deformação do plástico, demonstrando a incorporação de aditivos plásticos tóxicos no estuário do rio amazonas, o que representa riscos aos recursos hídricos, bioacumulação na biota e a biomagnificação nos níveis tróficos, afetando a população amazônica que apresenta dieta rica em recursos pesqueiros. A poluição plástica na Amazônia Costeira do Amapá apesar de ser perceptível ainda tem caráter invisível e desconhecido, com riscos até mesmo em áreas isoladas e conservadas (70% do território amapaense). Desse modo, essa pesquisa preenche lacunas e reforça a urgência de políticas públicas eficientes para a gestão de resíduos sólidos no estado, além de destacar a necessidade de monitoramento contínuo, ações de

mitigação, e ampliação de pesquisas sobre os efeitos ecotoxicológicos da PP na Amazônia Costeira.

Palavras-chave: Amapá; Estuário; Microplásticos; Poluição Plástica; Rio Amazonas;

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Modelo de apresentação: ( ) Pôster (x) Oral

TECHNOGENIC CONTAMINATION BY MICROPLASTICS IN A PUBLIC WATER SUPPLY RESERVOIR IN PRESIDENTE PRUDENTE, SÃO PAULO: EVIDENCE FROM AN ANTHROPOCENE PERSPECTIVE

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Abstract:

Microplastics are synthetic materials ranging in size from 0.1 to 5,000 micrometers (µm), classified as primary when produced at this scale, or secondary when resulting from the fragmentation of larger plastic items. Found across various environmental compartments—such as water, soil, and air—these polymers have a high capacity to adsorb persistent organic pollutants, posing significant risks to human health and biota. Due to their poor removal by conventional water treatment systems, identifying and monitoring microplastics in public water supply reservoirs is of critical importance. In this context, the present study was conducted in the Sabesp reservoir, located in the upper course of the Santo Anastácio River Basin, between the municipalities of Álvares Machado and Presidente Prudente (São Paulo State, Brazil), which supplies over 30% of the water consumed in Presidente Prudente.

Considering the historical land use and occupation processes and the intensification of human activities throughout the watershed, the initial hypothesis was that both the reservoir and its main contributing watercourses were contaminated by microplastics. Sampling was conducted in the Santo Anastácio River, Cedro Stream, Cedrinho Stream, and within the Sabesp reservoir itself, including surface water, bottom sediments, and macroplastic debris. Following sample filtration and separation, the materials were analyzed using a stereoscopic magnifier, optical microscopy, and micro-Raman spectroscopy. The macroplastic analysis allowed for the identification of fragmentation patterns and their relationship with the microplastics found. A total of 746 micrometric particles were identified, primarily composed of polyethylene (PE), polypropylene (PP), polyester (PS), polyethylene terephthalate (PET), isotactic polypropylene (iPP), and indigo dye.

The results confirmed a significant level of microplastic contamination in both the reservoir and its tributaries, characterizing the presence of recent technogenic deposits composed of synthetic materials of anthropogenic origin. These findings underscore the urgent need for systematic assessments of the effectiveness of water treatment systems in removing emerging contaminants, as well as for the

implementation of public policies aimed at mitigating plastic pollution in urbanized river basins. It is expected that the results of this research may support interinstitutional actions focused on improving environmental quality and regional water security.

Keywords: Microplastics; Technogenic Pollution; Water Supply Reservoirs; Anthropocene; River Basin.

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Presentation: ( ) Poster (X) Oral

More than fragmentation - microplastic transformation due to weathering factors

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Abstract:

The Anthropocene is characterized by the widespread introduction of synthetic materials, most notably polymers, into the environment. Microplastics, a significant byproduct of polymer degradation, are not only altering the natural environment but are also undergoing changes themselves as they interact with environmental factors such as UV radiation, exposure to water, and varying temperatures. These interactions can result in alterations in the physical and chemical properties of plastics. This emerging pollutant is considered a growing threat to living organisms, ecosystems, and human health. However, to assess the durability, persistence, and potential environmental risks of different polymers, it is crucial to consider the characteristics of aged plastics and their long-term behavior.
The presented study examines the changes in LDPE and PET plastics subjected to various abiotic weathering factors. Microplastics were artificially aged using environmental and UV chambers, simulating accelerated weathering processes in both water and dry environments. Using advanced techniques such as STXM synchrotron radiation, SEM, and Raman spectroscopy, the study provides detailed insights into the initial stages of fragmentation, the release of organic pollutants, and alterations in molecular composition. Additionally, the surface morphology of the microplastics was observed, highlighting the impact of weathering on their structure.
These findings have important implications for understanding the environmental interactions of microplastics, their toxicity, and bioavailability. Furthermore, they help in exploration of the potential use of weathered microplastics as a proxy for assessing pollution levels and environmental changes in the Anthropocene.

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Keywords: Anthropocene; microplastics, pollutants transformation

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