Società Chimica Italiana
Divisione di Spettrometria di Massa

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ABSTRACT BOOK

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WP-240 / ISOTOPIC NICHE SPACE OF SONGBIRDS MIGRATING THROUGH THE SOUTHERN ALPS

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Keywords: stable isotope ratios, Passerines, Alps, isotopic niche

Introduction
Stable isotopes are a practical tool used to define animal movements and to delineate trophic structures in animal communities [1, 2]. A crucial aspect of spatial ecology is the definition of the degree of isotopic variability that can be measured locally in animal tissues, in order to carry out the correct probabilistic assignments to a geographic location, calibrating the isotopic discrimination between stable isotopes in trophic sources and animal tissues [3].

Methods
Stable isotope ratios of bio-elements (^{2}H, ^{18}O, ^{13}C, ^{15}N, ^{34}S) were determined in feathers of Passerines from the Italian Alps. The feathers were sampled on an altitudinal gradient in a restricted region from juvenile and post-breeding generations. Stable isotope ratios were determined by Isotope Ratio Mass Spectrometry after preparation of the feathers according to Bontempo et al. (2014) [4].

Results
Isotopic variations can be mainly related to species feeding habits [5], seasonal effect of regional climatic conditions [6], geographic and topographic patterns [7, 8], natural or anthropogenic inputs which perturbate the local isoscapes [9, 10]. Through this study we assessed the probable variability sources, taking into account the distinct stable isotope ratios separately. In particular, the local variability in the sampling sites within a specific area of Italian Alps was measured, comparing the isotopic composition in feathers of several common Passerine species sampled from different moult generations in moulting and fattening sites within or close to the breeding locations. Using the derived information it was possible to determine the specific regional multi-isotopic variability, as well as to define seasonal isotopic variability related to trophic and habitat niches.

Conclusions
The local variability of the isotopic composition within the sampling sites, comparing different species and different feathers generations was measured. In particular, the regional multi-isotopic variability for Passerines according to trophic sources and animal tissues was defined. This information is crucial in depicting the isotopic niche in local birds of Central Alps, deepening the knowledge about isotopic variability related to topographic, environmental and seasonal perturbations.

Novel Aspect
Isotopic variability in avian keratinous tissues was estimated with a multi-isotopic approach in a narrow Alpine region. The concept of isotopic niche was deepened.

References
1. Hobson K. A. Divers Distrib, 11,157–164 (2005).
2. Layman C. A., Arrington D. A., Montana C. G., Post D. M., Ecology, 88,42–48 (2007).
3. Wunder M. B., Norris D. R., In: Hobson K. A., Wassenaar L. I. (eds) Tracking animal migration with stable isotopes. Elsevier, 107–128 (2008).
4. Bontempo L., Ceppa A., Ziller L., Pedrini P., Hobson K. A., Wassenaar L. I., Camin F., methods Ecol Evol, 5, 363-371(2014).
5. Hobson K. A., Van Wilgenburg S. L., Faaborg J., et al, J F Ornithol,85,237–257 (2014).

6. Bortolotti L. R., Clark R. G., Wassenaar L. I., Ecol Appl,23,110–121 (2013).
7. Bowen G. J., Wassenaar L. I., Hobson K. A., Oecologia, 143,337–348 (2005).
8. Newsome S. D., Sabat P., Wolf N., et al. Ecosphere, 6,1-18 (2015)
9. Hebert C. E., Wassenaar L. I., Wildl Soc Bull, 33,92–102 (2005).
10. Yi-Balan S. A., Amundson R., Buss H. L, Geochim Cosmochim Acta, 142,411–428 (2014).

WP-241 / EXPERIMENTAL EVALUATION OF TIMS-BASED DETECTION METHODS FOR ISOTOPIC ANALYSIS OF URANIUM AT ULTRA-TRACE LEVEL

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Keywords: TIMS, Isotopic Analysis, Uranium, Detection Method, Nuclear Safeguards

Introduction
Thermal ionization mass spectrometry (TIMS) is one of the most accurate and precise techniques for isotopic analysis, and suitable for monitoring undeclared nuclear activities[1-3]. The analytical performance of the three TIMS-based detection methods was experimentally evaluated for isotopic analysis of uranium at ultra-trace levels, in terms of analytical accuracy, precision, and measurement uncertainty.

Methods
Isotopic measurement of uranium at 1 ng, 100 pg, 30 pg, 5 pg, and 1 pg levels were performed by TIMS (TRITON Plus, Thermo) using three detection methods; Dynamic, multi-dynamic, and static methods. Analytical performance, such as accuracy, precision, and measurement uncertainty, was experimentally evaluated depending on the detection methods.

Results
The TIMS analysis for the ten replicated U samples with amounts of 1 ng and 100 pg showed no significant improvement in analytical performance irrespective of the detection method adopted, whereas slight improvement was observed for the analysis of 30 pg uranium using the multi-dynamic and static detection methods. Considering the analytical performance and the easiness of detector calibration, the preferred detection methods for 1 ng and 100 pg U is the multi-dynamic method, while that for 30 pg U is the dynamic method. The static detection method offers the greatest accuracy and precision, and the smallest uncertainty for TIMS measurements of 5 pg and 1 pg of U due to the greater detection sensitivity of ion counters than faraday cups, the elimination of ion signal drift, and the large number of valid data sets in a measurement.

Conclusions
This study deals with the evaluation of three detection methods (multi-dynamic, dynamic, and static) in the isotopic analysis of ultra-trace amounts of uranium using thermal ionization mass spectrometry. For samples containing 5 pg and 1 pg uranium, the static detection method provided the best results in terms of accuracy, precision, and measurement uncertainty.

Novel Aspect
This study shows that the static detection method of TIMS can be applied to particle analysis of environmental samples for nuclear safeguards.

References
1. Donohue D., Anal. Chem., 74, 28A (2002)