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## Burning of olive tree branches: a major organic aerosol source in the Mediterranean

E. Kostenidou<sup>1</sup>, C. Kaltsounoudis<sup>1,2</sup>, M. Tsilikiotou<sup>1,2</sup>, E. Louvaris<sup>1,2</sup>, L. M. Russell<sup>3</sup>, and S. N. Pandis<sup>1,2,3</sup>

<sup>1</sup>Institute of Chemical Engineering Sciences, ICE-HT, Patras, Greece

<sup>2</sup>Department of Chemical Engineering, University of Patras, Patras, Greece

<sup>3</sup>Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh, USA

<sup>4</sup>Scipps Institute of Oceanography, University of California, San Diego, 92093, USA

Correspondence to: S. N. Pandis (spyr@schemeng.upatras.gr)

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**Abstract.** Aerosol produced during the burning of olive tree branches was characterized with both direct source sampling (using a mobile smog chamber) and with ambient measurements during the burning season. The fresh particles were composed of 80% organic matter, 8–10% black carbon (BC), 5% potassium, 3–4% sulfate, 2–3% nitrate and 0.8% chloride. Almost half of the fresh olive tree branches burning organic aerosol (otBB-OA) consisted of alkane groups. Their mode diameter was close to 70 nm. The oxygen to carbon (O:C) ratio of the fresh otBB-OA was  $0.29 \pm 0.04$ . The mass fraction of levoglucosan in  $PM_{10}$  was  $0.034\text{--}0.043$ , relatively low in comparison with most fuel types. This may lead to an underestimation of the otBB-OA contribution if levoglucosan is being used as a wood burning tracer. Chemical aging was observed during smog chamber experiments, as  $I_{44}$  and O:C ratio increased, due to reactions with OH radicals and  $O_3$ . The otBB-OA AMS mass spectrum differs from the other published biomass burning spectra, with a main difference at  $m/z$  60, used as levoglucosan tracer. In addition to particles, volatile organic compounds (VOCs) such as methanol, acetonitrile, acrolein, benzene, toluene and xylenes are also emitted. Positive matrix factorization (PMF) was applied to the ambient organic aerosol data and 3 factors could be identified: OOA (oxygenated organic aerosol, 55%), HOA (hydrocarbon-like organic aerosol, 11.3%) and otBB-OA (33.7%). The fresh chamber otBB-OA AMS spectrum is close to the PMF otBB-OA spectrum and resembles the ambient mass spectrum during olive tree branches burning periods. We estimated an otBB-OA emission factor of  $3.5 \pm 0.9 \text{ g kg}^{-1}$ . Assuming that half of the olive tree branches

pruned is burned in Greece,  $2300 \pm 600$  tons of otBB-OA are emitted every year. This activity is one of the most important fine aerosol sources during the winter months in Mediterranean countries.

### 1 Introduction

In all, 95% of the global biomass burning is anthropogenic resulting from efforts to clear land, convert forests to agricultural and pastoral lands, heat residences and dispose agricultural waste (Crutzen and Andreae, 1990; Schüle, 1990; Andreae and Merlet, 2001). Biomass burning can contribute up to 90% of fine particulate matter in the burning season in the Amazon (Yamasoe et al., 2000). During the winter, biomass combustion is one of the major sources of organic aerosol in large parts of Europe (Puxbaum et al., 2007). The release height of the emissions is low and the mixing during the winter months is often weak, leading to the deterioration of local air quality and visibility and an increase in the risk of adverse effects on human health especially in populated areas (Lighty et al., 2000; Boman et al., 2003; Nacher et al., 2007). Biomass burning particles also affect earth's albedo (Crutzen and Andreae, 1990; Andreae, 1995) and can act as cloud condensation nuclei (CCN), modifying the cloud droplet size distribution and therefore the reflectivity of clouds (Rogers et al., 1991; Roberts et al., 2002).

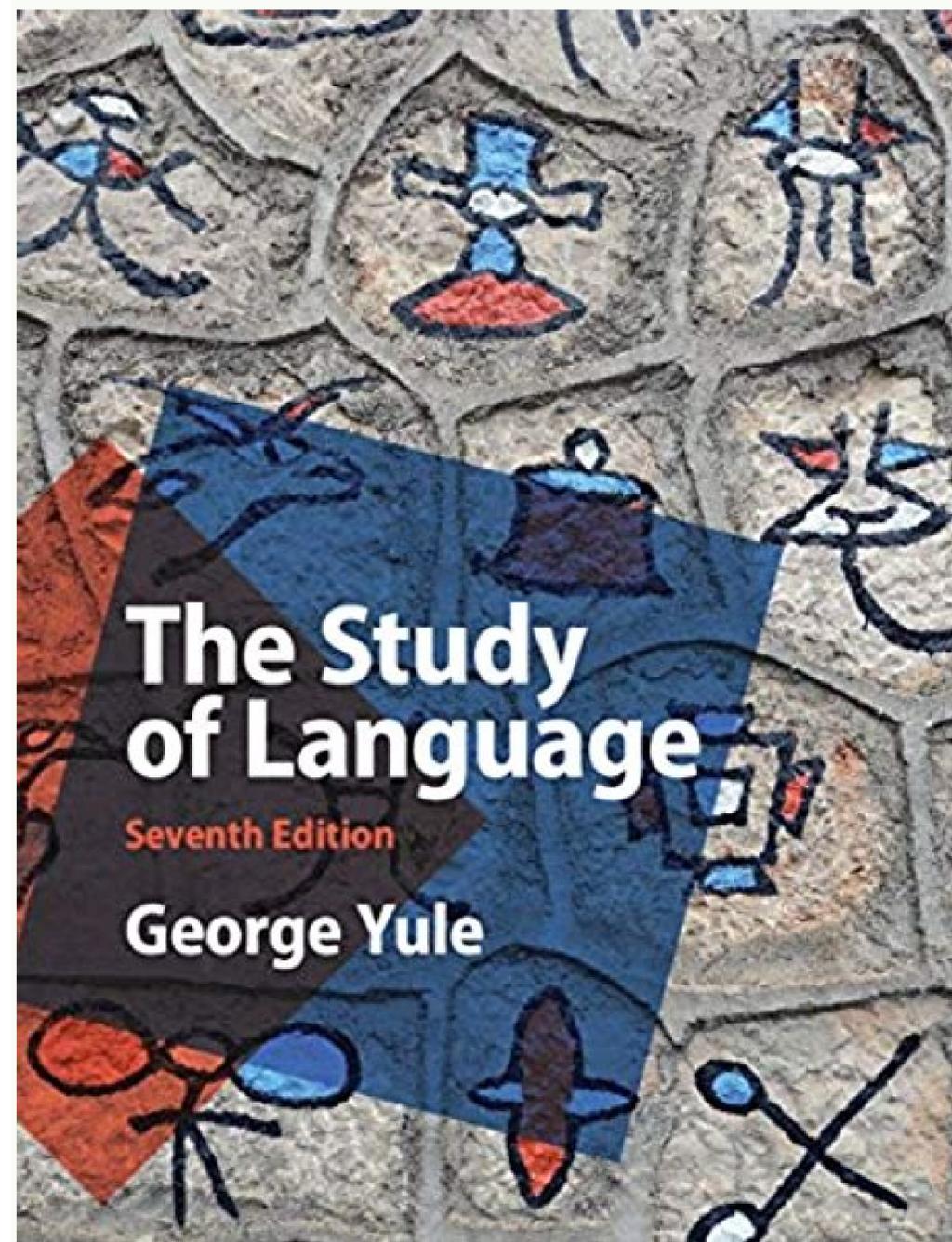
Numerous laboratory-based studies have been conducted for the physical and chemical characterization of biomass combustion aerosol (e.g., Shafiqzadeh, 1984; Abas et al.,

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# The Study of Language

Seventh Edition

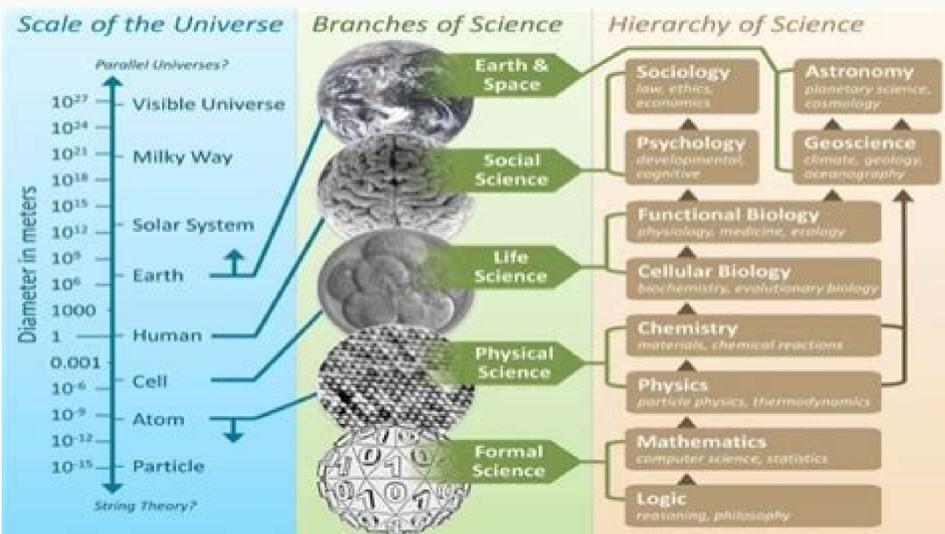
George Yule



# Pragmatics vs. Semantics (1)

- Pragmatics is defined as another branch of linguistics that is concerned with meaning.
- Pragmatics and semantics, both, are concerned with the speaker's ability to use the language meaningfully.

semantics chapter 2 05/21/15



Major branches of linguistics pdf. Major branches of linguistics. Branches of linguistics.

1. Linguistics branches 1 by Ashish Prasad and Apurv Verma 2. What is linguistics? 3. What's scientific study of human language. 4. What is the knowledge of language? (Competence) is it? 5. How is knowledge of language acquired? (Acquisition) is it? 6. How is knowledge of language used? (Performance/Language Processing) 7. Language is developed 8. The language is a purely human and non-instinctive method to communicate ideas, emotions and desires by means of symbols produced voluntarily. 9. Sapir (1884-1939): Language: an introduction to the study of speech (1921) 10. A. S. - ago now, considering the language a set (finished or infinite) of sentences, each of length finished and built by a finished set of elements. 11. hea 12. developed chomsky (1928-): Syntactic structures (1957) 13. Importance of language is 14. invented. 15. E. S. "distinguishes us from other creatures. 16. E. S. "provides a means of thinking effectively, communicating interpersonally and collaborating with other people in the work. 17. A. S. impossible to imagine a world without language. 18. Languages of the world 19. Main branches of linguistics is 20. A. 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