

Fig. 1. An early model for physical and chemical sediment–water interactions (modified from Hart and Davies 1977).

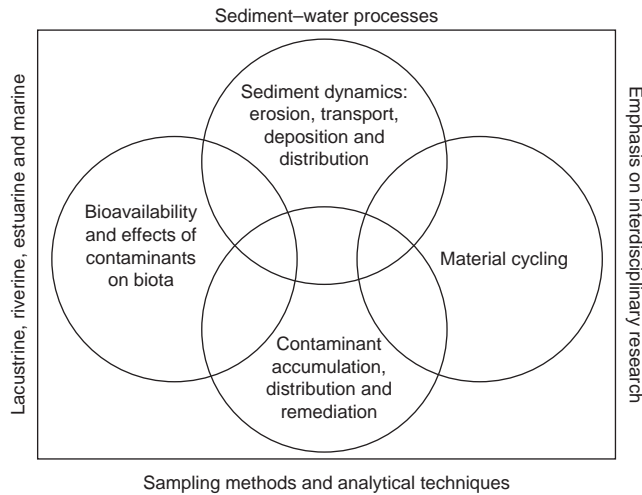


Fig. 2. The dominant themes addressed at International Association for Sediment Water Science symposia over 30 years. The inclusion of topics surrounding the box is implicit throughout all themes.

historical semantics aside, the group recognised that sediment in, or in contact with, the water column was a vector and/or potential source of pollutants and contaminants. Recognition that chemical, hydrodynamic and biological processes at the sediment–water interface were regulating material exchanges, and thereby habitat quality (Fig. 1), led to the interdisciplinary emphasis of the symposia. Mechanisms of sediment–water interactions and transfers, as well as the biogeochemical processes occurring at the sediment–water interface, were seen as critical in addressing these problems.

Over the 30 years of symposia, there have been several recurring themes addressed by IASWS members (Fig. 2). It is clear from the contents of the four spheres that these dominant themes are not strictly independent of each other and therefore are presented graphically as overlapping. Within each of these themes, changing sampling methodologies and analytical techniques have been presented and occasionally been given specific sessions or publication preference. Each theme applies to the full range of aquatic environments and can be addressed from several disciplinary perspectives. Therefore, running throughout the themes at all symposia is the assumption of interdisciplinary participation.

has been made to regularly move the meetings among continents, and to maintain broad international representation on the board of directors. The following six meetings were held in Uppsala, Sweden (1990), Santa Barbara, USA (1993), Baveno, Italy (1996), Beijing, China (1999), Banff, Canada (2002) and Lake Bled, Slovenia (2005). The meetings have on average hosted 150 members with 120 presentations. National representation at these meetings has ranged between 23 and 34 countries. These mid-sized meetings have generally been structured with three to four parallel sessions running over 3.5 days with a mid-week field trip for all registrants. The 11th symposium in 2008 was held in Esperance, Australia although the contents and structure of that meeting are not reflected in this paper.

Themes in sediment–water science

The initial recognition that a separate venue was needed for discussions of the relevance and impact of sediment–water interactions occurred in 1974 when issues of water quality and aquatic contaminant transport were beginning to be considered global concerns. While ecosystem health and management was not the terminology used at the time, there was a distinct recognition by the early organising committees that sediment played a useful role in the eutrophication and pollution of aquatic habitats. In a summary of the first meeting, Golterman (1977) stated that clarifying the physical and functional definitions of sediment was problematic, rendering them difficult to use as a logical framework for a symposium. Putting those

General patterns observed from publication content analysis

Both quantitative and qualitative content analysis of the 524 publications were undertaken for presentation here. Categorisation and enumeration of various aspects of the papers was completed to quantify the period's changing themes and research approaches. A second more subjective analysis of the content of this literature was carried out (sub-headings) to identify patterns of change observed in some of the scientific themes running throughout the period of record. Content analysis of the IASWS publications potentially presents a biased perspective on the full range of subject matter presented at the meetings as the portion of papers published varies between 24 and 85% of the oral presentations. While IASWS editors have always attempted to incorporate papers that represent significant findings as well as reflect the dominant themes of the meetings, the reduction of published papers in recent years inevitably means a loss of information, both scientific and historical. In my review of the 10 IASWS publications, I recognised the limitation of this method, but felt an analysis of the available data provided useful information and insights on the changing approaches and emphases in sediment–water science over the three decades that environmental research burgeoned.

A list of the 10 IASWS publications, the journal special issues associated with the various symposia and the number of papers included in each is provided in Table 1.

Table 1. International Association for Sediment Water Science symposia and publication details

Publication	Location (date)	No. papers
'Interactions between Sediments and Fresh Water. Proceedings of the 1st International Symposium.' 1977. (Ed. H. L. Golterman.) pp. 473. (Dr W. Junk: The Hague, The Netherlands.)	Amsterdam, The Netherlands (6–10 September 1976)	71
'Sediment/Freshwater Interaction. Proceedings of the 2nd International Symposium. Developments in Hydrobiology 9.' 1982. (Ed. P. G. Sly.) pp. 700. (Dr W. Junk: The Hague, The Netherlands.) Reprinted from <i>Hydrobiologia</i> (1982) Vol. 91/92.	Kingston, Canada (15–18 June 1981)	68
'Sediments and Water Interactions. Proceedings of the 3rd International Symposium.' 1986. (Ed. P. G. Sly.) pp. 521. (Springer-Verlag: New York.)	Geneva, Switzerland (27–31 August 1984)	44
'Sediment/Water Interactions IV. Proceedings of the 4th International Symposium. Developments in Hydrobiology 50.' 1989. (Eds P. G. Sly and B. T. Hart.) pp. 533. (Kluwer Academic Publishers: Belgium.) Reprinted from <i>Hydrobiologia</i> (1989) Vol. 176/177.	Melbourne, Australia (16–20 February 1987)	51
'Sediment/Water Interactions V. Proceedings of the 5th International Symposium. Developments in Hydrobiology 75.' 1992. (Eds B. T. Hart and P. G. Sly.) pp. 743. (Kluwer Academic Publishers: Belgium.) Reprinted from <i>Hydrobiologia</i> (1992) Vol. 235/236.	Uppsala, Sweden (6–9 August 1990)	66
'Interactions between Sediments and Water. Proceedings of the 6th International Symposium.' 1995. Special Issue of <i>Marine and Freshwater Research</i> Vol. 46, No. 1, pp. 1–418.	Santa Barbara, USA (5–9 December 1993)	43
'The Interactions between Sediments and Water. Proceedings of the 7th International Symposium.' 1997. (Eds R. D. Evans, J. Wisniewski and J. R. Wisniewski.) pp. 739. (Kluwer Academic Publishers: London.) Reprinted from <i>Water, Air and Soil Pollution</i> (1997) Vol. 99, Nos. 1–4.	Baveno, Italy (22–25 September 1996)	72
'Thematic issue: Proceedings of the 8th International Symposium on Sediment-Water Interactions.' 2001. <i>Science of the Total Environment</i> , VI, 266, pp. 1–326.	Beijing, China (13–17 September 1999)	35

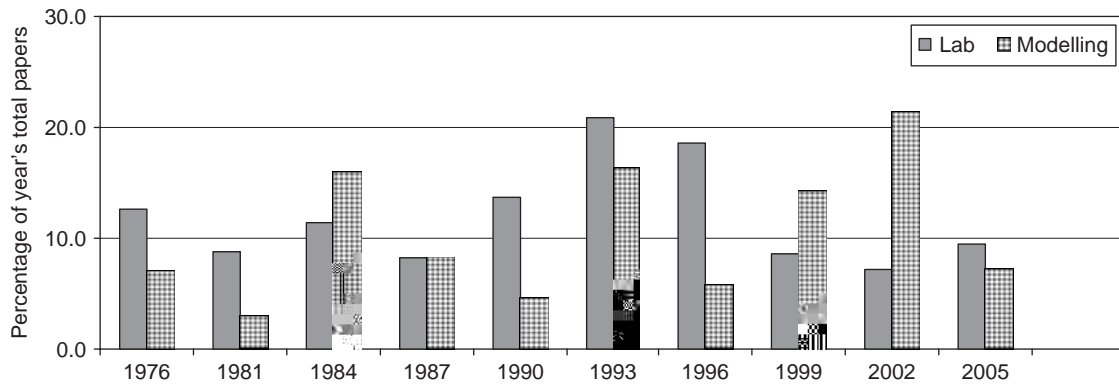


Fig. 4. Changing pattern in the proportion of modelling and laboratory-based studies from each year of International Association for Sediment Water Science publications.

Nutrients

Given the limnological associations of most of the early symposia organisers, one of the original topics of interest was the cycling of nutrients, specifically phosphorus (P). At the first meeting, 30% of the papers dealt with P dynamics, reflecting the global concern at the time about lake eutrophication (e.g. DiGiano and Snow 1977; Lee *et al.* 1977). Over the next 30 years, research reporting on both nitrogen (N) and P continued, but recently there has been a renewed focus on P and N loadings and transfers, due in part to regulations initiated via the European Water Framework Directive (e.g. Owens and Walling

allowing later flux determinations of nutrients and contaminants (e.g. Ciceriet al. 1992; Barbantet al. 1995). Later work at the sediment–water interface incorporated hydrodynamic effects on the flux and dissipation of materials (Huettel

- Plumb, R. H., Jr, and Lee, G. F. (1977). The impact of taconite tailings on dissolved solids concentrations in Lake Superior. In 'Interactions between Sediments and Fresh Water. Proceedings of the 1st International Symposium'. (Ed. H. L. Golterman.) pp. 423–434. (Dr W. Junk: The Hague, The Netherlands.)
- Senior, A., Green, M., and Oldman, J. (2003). Using deterministic models to assess risk in sediment-impacted estuaries. In 'The Interactions between Sediments and Water. Proceedings of the 9th International Symposium on the Interactions between Sediments and Water'. (Ed. B. Kronvang.) pp. 11–16. (Kluwer Academic Press: London.)
- Shields, F. D., Jr, Knight, S. S., Morin, N., and Blank, J. (2003). Response of fishes and aquatic habitats to sand-bed stream restoration using large woody debris. In 'The Interactions between Sediments and Water. Proceedings of the 9th International Symposium on the Interactions between Sediments and Water'. (Ed. B. Kronvang.) pp. 251–257. (Kluwer Academic Press: London.)
- Slaymaker, O. (1982). Land use effects on sediment yield and water quality. In 'Sediment/Freshwater Interaction. Proceedings of the 2nd International Symposium. Developments in Hydrobiology 9'. (Ed. P. G. Sly.) pp. 93–110. (Dr W. Junk: The Hague, The Netherlands.)
- Sly, P. (1989). Sediment dispersion: part 2, characterization by size of sand fraction and percent mud. In 'Sediment/Water Interactions IV. Proceedings of the 4th International Symposium Developments in Hydrobiology 50'. (Eds P. G. Sly and B. T. Hart.) pp. 111–124. (Kluwer Academic Publishers: Belgium.)
- van der Perk, M., Owens, P. N., Deeks, L. K., and Rawlins, B. G. (2006). Streambed sediment geochemical controls on in-stream phosphorus concentrations during base flow. In 'The Interactions between Sediment and Water. Proceedings of the 10th International Symposium'. (Eds B. Kronvang, J. Faganeli and N. Ogrinc.) pp. 79–88. (Springer: Dordrecht, The Netherlands.)
- Yerret, J. P., Rapin, F., and Scolari, G. (1977). Heavy metal content of lake and river sediments in Switzerland. In 'Interactions between Sediments and Fresh Water. Proceedings of the 1st International Symposium'. (Ed. H. L. Golterman.) pp. 390–397. (Dr W. Junk: The Hague, The Netherlands.)

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