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Subject-specific human carotid artery flow simulation

Cardiovascular disease is a major cause of death worldwide. Fluid mechanics is thought to play a role in the genesis and progression of cardiovascular diseases like atherosclerosis. Observations have shown that there is a correlation between certain forms of blood flow like separated flows and arterial wall alterations. Such flow phenomena take place in vessel bifurcations or bends and are associated with sites prone to atherosclerosis. Subject-specific blood flow description which is of value in diagnosis and surgical planning can be attempted taking help from developments in modern medical imaging and computational fluid dynamics (CFD). M. D. Deshpande *et al.* (page 1303) report their study where subject-specific blood flow simulation was carried out in the carotid artery bifurcations of two volunteers. Three-dimensional vascular geometry was extracted from magnetic resonance imaging (MRI) scans and periodic velocity boundary conditions were constructed using Doppler ultrasonography. The pulsatile blood flow was simulated by solving the Navier–Stokes equations. Flow separation and associated reversed wall shear stress were observed in some bifurcations. Details of flow that are obtained from MRI and Doppler ultrasound combined with CFD techniques are far superior to those that may be obtained by medical imaging techniques alone.

Trace gases and CO₂ isotope records

In 1990, S. K. Bhattacharya and R. J. Francey started discussions relating to stable isotope measurements in the atmosphere and tree rings. Ideas to explore ‘Monsoon effect on atmospheric CO₂’ led Francey to identify promptly a funding opportunity via an IAEA Cooperative Research Project. and a cooperative tropospheric sampling was established in the Arabian Sea region (Cabo de Rama

(CRI), India) for the initial 3-years period (1992–1994). Sparse equatorial coverage made this a valuable complement to global sampling, and CSIRO Global Atmospheric Sampling Laboratory (then developing advanced coordinated multi-species measurements focusing on greenhouse gases) underpinned the proposal. Although Lakshadweep group of islands were initially identified as suitable for sampling, the move to CRI site offered better access to significant regional ocean and terrestrial fluxes, and was aided by crucial institutional support for sampling by D. V. Borole of NIO and R. A. Jani of PRL. Sampling continued with additional 3-year funding from IAEA, and with bilateral India–Australia funding for exchange visits. Funding constraints led to the cessation of sampling in 2002. Bhattacharya *et al.* (page 1336) present the advances in atmospheric transport modelling; permitting the accurate representation of the monsoonal systems, better demonstrating the significant global value of the early data. For CH₄ and CO, low concentrations are found during the northern summer when CRI is under the influence of the south-west monsoon and SH air mass. Their concentrations are generally higher in the winter or north-east monsoon season, which capture the signal of emission from the Indian region. The N₂O seasonal cycle is relatively weak and cannot be explained by the change in monsoon dynamics alone. The seasonality of CO₂ concentration is further complicated, and shows a minimum in October. The $\delta^{13}\text{C}-\text{CO}_2$ and $\delta^{18}\text{O}-\text{CO}_2$ isotopic signatures in atmospheric CO₂ suggest the role of terrestrial uptake in producing the seasonal minimum. Atmospheric H₂ shows a well-known seasonal cycle resulting from its global emission pattern and strong soil sink.

Analysis of timber and coating material of an iron anchor

Since centuries Indian teakwood was used in construction of shipbuilding

both in India and abroad because of its endurance, resilience and strength. With the advent of Portuguese in India, they recognized the superiority of Indian teakwood and used extensively in the shipbuilding and promulgated orders neither to cut nor to sell teakwood. This has been corroborated with both written documents and shipwreck findings. The Long shanked Admiralty type of iron anchor wooden stock found off Aguada Bay and the ships wrecked off Kenya and Australia were made of Indian teakwood.



Recently, another Long shanked Admiralty type of iron anchor with wooden stock was recovered off the Aguada Bay. The anatomical analysis of the timber shows that the upper and lower timbers are made of *Terminalia* spp. and *Phoebe* spp. belonging to Combretaceae and Lauraceae respectively. The details of the anchor, analysis of wooden stock and coating material applied on the anchor have been discussed in pages 1361–1368. These two genera might have been brought by the Portuguese mariners from Tropical countries en-route their voyages including Indo-Malayan region, Pacific Islands, Tropical America and the West Indies.

The study shows that not only Indian teakwood but also other timbers such as *Terminalia* and *Phoebe* spp. had better endurance in tropical seas which were used by the Portuguese in shipbuilding. Presumably coating material has been applied on anchor and stock for better endurance and protection in the tropical waters.