KOH MEI KEE

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SANDBAR REGULATED HYDRODYNAMIC INFLUENCES ON HYDROCHEMISTRY OF MENGABANG TELIPOT ESTUARY, PENINSULAR MALAYSIA

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Chairperson : Senior Lecturer, Edlic Sathiamurthy, Ph. D

Member : Professor Norhayati Mohd Tahir, Ph. D
Associate Professor Suhaimi Suratman, Ph. D

Faculty : Institute of Oceanography and Environment

Influences of river and groundwater hydrodynamic behaviours (water level, flow velocity and flow rate) on hydrochemistry (salinity, pH, dissolved oxygen (DO) saturations and dissolved phosphate (DP)) were evaluated through high spatial and temporal resolution study at sandbar-regulated Mengabang Telipot estuary. River and groundwater levels were measured using stick gauge and pressure transducer sensor. River flow velocity was measured using Valeport flow meter. River flow rate was calculated from stage-area curve. River and groundwater were sampled sub-daily at high tide and low tide. Salinity, pH and DO were measured in-situ using YSI Multi-parameter probe. DP was determined using ascorbic acid method.

River hydrodynamic during sandbar closed event was characterized by minor dependency on tidal fluctuations, gradual increase of water level, continual low flow velocity and flow rate. These hydrodynamic behaviours established a hydrochemistry equilibrium, in which water properties generally were characterized by virtual absence of horizontal gradients while vertical stratifications were significant. In addition, the river was in high trophic status as algae blooms were visible. Conversely, river hydrodynamic in sandbar opened event was tidal-controlled and showed higher flow velocity. Horizontal gradients of water properties became significant while vertically more homogenised and with lower trophic status. Groundwater hydrodynamic during sandbar closed event was less controlled by tides and the water level gradually increased through time. On the contrary, groundwater level during sandbar opened event was tide controlled. The closure and opening of sandbar regulate hydraulic head

difference between beach and inland groundwater aquifers and thereby affected salinity and DP distributions.

In essence, the study results indicated that the closure and opening of sandbar are the main mechanisms structuring the river and groundwater hydrodynamic behaviours. Changes of hydrodynamic behaviours affect river and groundwater hydrochemistry, creating distinct hydrochemistry equilibriums. However, the influence of hydrodynamic behaviours on hydrochemistry was less significant in groundwater system compared to river system.

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Ijazah Sarjana Sains.

PENGARUH HIDRODINAMIK YANG DIKAWAL OLEH BETING PASIR TERHADAP HIDROKIMIA MUARA MENGABANG TELIPOT, SEMENANJUNG MALAYSIA

KOH MEI KEE

Februari 2014

Pengerusi : Pensyarah Kanan, Edlic Sathiamurthy, Ph. D

Ahli : Profesor Norhayati Mohd Tahir, Ph. D
Profesor Madya Suhaimi Suratman, Ph. D

Fakulti : Institut Oseanografi dan Sekitaran

Pengaruh hidrodinamik (paras air, halaju aliran dan kadar aliran) sungai dan air bumi terhadap hidrokimia (kemasinan air, pH, ketepuan oksigen terlarut (DO) dan fosfat terlarut (DP)) telah dinilai pada leraian ruang and masa yang tinggi di muara yang dikawal oleh beting pasir. Paras sungai dan air bumi masing-masing diukur dengan menggunakan tolok lurus dan sensor tekanan. Halaju aliran sungai diukur menggunakan Valeport meter aliran. Kadar aliran sungai dikira berdasarkan keluk paras air-luas. Air sungai dan air bumi telah disampel pada kadar sub-harian pada waktu air pasang dan air surut. Kemasinan air, pH dan DO telah diukur in-situ dengan menggunakan YSI Multi-parameter probe. DP telah ditentukan menggunakan kaedah asid askorbik.

Hidrodinamik sungai semasa penutupan beting pasir dicirikan dengan kurang pergantungan pada perubahan air pasang surut, peningkatan paras air secara beransuran dan halaju aliran yang rendah. Hidrodinamik sedemikian mewujudkan keseimbangan hidrokimia yang dicirikan dengan ketidakwujudan kecerunan mendatar dan stratifikasi menegak yang ketara. Di samping itu, sungai tersebut berada dalam status trofik yang tinggi dan ini dibuktikan dengan pertumbuhan alga yang berleluasan. Sebaliknya, hidrodinamik sungai semasa pembukaan beting pasir dikawal oleh air pasang surut dan menunjukkan halaju aliran yang lebih tinggi. Kecerunan mendatar hidrokimia menjadi ketara manakala stratifikasi menegak dan status trofik berkurangan. Hidrodinamik air bumi semasa penutupan beting pasir kurang bergantung kepada air pasang surut dan paras air meningkat secara beransuran. Sebaliknya, hidrodinamik air bumi semasa pembukaan

beting pasir dikawal oleh air pasang surut. Penutupan dan pembukaan beting pasir mengawal perbezaan turus hidraulik antara akuifer pantai dan kawasan pedalaman. Keadaan sedemikian turut mempengaruhi taburan kemasinan air dan DP.

Secara keseluruhannya, hasil kajian menunjukkan bahawa penutupan dan pembukaan beting pasir adalah mekanisme utama yang mengstruktur hidrodinamik sungai dan air bumi. Perubahan hidrodinamik turut membentuk keseimbangan hidrokimia yang berbeza dalam sungai dan air bumi. Namun demikian, pengaruh hidrodinamik terhadap hidrokimia adalah kurang penting dalam sistem air bumi berbanding dengan sistem sungai.