Geophysical Research Abstracts
Vol. 15, EGU2013-8413, 2013
EGU General Assembly 2013

Climate change impacts on faecal indicator and waterborne pathogen concentrations and disease

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Changes in temperature and precipitation patterns may impact on the concentrations of the faecal indicator E. coli and waterborne pathogens, such as Cryptosporidium, in the surface water, and consequently – through drinking water, recreational water or consumption of irrigated vegetables – on the risk of waterborne disease. Although an increased temperature would generally increase the decline of pathogens and therefore decrease the surface water concentrations, increased precipitation and an increased incidence of extreme precipitation may increase surface water concentrations through increased (sub-)surface runoff and an increased risk of sewer overflows. And while the diluting effect of increased precipitation decreases the surface water concentration, decreased precipitation increases the percentage of sewage in the surface water and therefore increases the concentration. Moreover, (extreme) precipitation after drought may also increase the concentration. Changes in behaviour, such as increased recreation and irrigation with higher temperatures may impact on the disease risk. What the balance is between these positive and negative impacts of climate change on faecal indicator and waterborne pathogen concentrations and disease is not well known yet. A lack of available statistical or process-based models and suitable scenarios prevents quantitative analyses. We will present two examples of recent studies that aim to assess the impact of climate change on faecal indicator concentrations and waterborne disease. The first is a study on the relationship between climate variables and E. coli concentrations in the water of river systems in the Netherlands for the period 1985 – 2010. This study shows that each of the variables water temperature (negatively), precipitation and discharge (both positively) are significantly correlated with E. coli concentrations for most measurement locations. We will also present a linear regression model, including all of these variables. In the second example we assess the relationship between the weather variables precipitation and minimum and maximum temperature and the number of diarrhoeal cases in Ethiopia. We have digitised data from the Ethiopian health service and hospitals on the number of diarrhoeal cases for the period 2005 – 2010 and used meteorological data from their weather service. Very strong correlations can be found between the monthly weather variables and the number of diarrhoeal cases and a linear regression model including all variables explains a large part of the variability of the data. The studies indicate that climate change may increase the waterborne pathogen concentration in surface water and disease risk and should therefore not be ignored as a threat to microbial water quality.