

# HOAPS – A new satellite-derived freshwater flux climatology

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(Manuscript received October 19, 2000; in revised form December 21, 2001; accepted December 21, 2001)

## Abstract

HOAPS (Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data) is a global climatology of sea surface parameters and surface energy and freshwater fluxes derived from satellite radiances for the time period July 1987 to December 1998. Data from polar orbiting radiometers, the Special Sensor Microwave/Imager (SSM/I) and the Advanced Very High Resolution Radiometer (AVHRR), have been used to get global fields of surface meteorological and oceanographic parameters but also latent heat flux, evaporation, precipitation and net freshwater flux over ice free ocean areas for various averaging periods and grid sizes. All retrieval methods have been validated with in situ data on a global scale to the extent possible. In this paper some of the major outcomes are exemplarily shown together with the results of comparison studies with the in situ climatology provided by the Southampton Oceanography Centre (SOC).

## Zusammenfassung

HOAPS (Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data) ist eine globale Klimatologie ozeanographischer und meteorologischer Parameter sowie von Energie- und Süßwasserflüssen an der Meeresoberfläche, die für den Zeitraum Juli 1987–Dezember 1998 aus Satellitenmessungen gewonnen wurden. Daten von Sensoren polarumlaufender Satelliten, nämlich des Special Sensor Microwave/Imager (SSM/I) und des Advanced Very High Resolution Radiometer (AVHRR), wurden genutzt, um globale Felder dieser ozeanographischen und meteorologischen Parameter, aber auch des latenten Wärmeflusses, der Verdunstung, des Niederschlags und des Süßwasserflusses über dem eisfreien Ozean in unterschiedlichen räumlichen und zeitlichen Auflösungen abzuleiten. Soweit möglich wurden alle dabei genutzten Fernerkundungsverfahren mit in situ Daten auf einer globalen Skala verglichen. In diesem Artikel werden die wichtigsten Ergebnisse beispielhaft vorgestellt und gemeinsam mit den Resultaten aus Vergleichsstudien mit der in-situ Klimatologie des Southampton Oceanography Centre (SOC) diskutiert.

## 1 Introduction

The freshwater flux and the connected energy fluxes at the air-sea interface are amongst the most challenging parameters to be derived from satellite measurements. The knowledge of turbulent fluxes between ocean and atmosphere is, along with radiative fluxes, of major importance for the understanding of the climate system. Accurate fields of these fluxes can be used for direct forcing of ocean circulation models or for evaluating the results of coupled climate models.

Conventional estimates of global fields of freshwater flux between ocean and atmosphere suffer in most areas of the globe from inadequate spatial and temporal sampling. Additionally, the parameters determining the freshwater flux are very difficult to measure on buoys or ships. Satellite measurements have the potential to circumvent some of these difficulties. In the last

two decades many efforts have been spent in developing methods to derive geophysical parameters like water vapour content, radiative fluxes, etc. from geostationary and polar orbiting satellites. Retrievals developed for radiometers on polar orbiting satellites like the Advanced Very High Resolution Radiometer (AVHRR) on the NOAA series or the Special Sensor Microwave/Imager (SSM/I) on the Defense Meteorological Satellite Program (DMSP) are distinguished by accuracies that are competitive with in situ measurements.

To provide a basis for studying the local, regional and global variability of important energy and water cycle components over the global oceans recently developed remote sensing methods have been applied to data of the SSM/I and the AVHRR to establish a 12 year (July 1987–December 1998) satellite-derived climatology HOAPS (Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite Data). It contains global fields of heat and freshwater fluxes (among others) as averages over a variety of time spans and spatial grid sizes. Further details on HOAPS may be found in SCHULZ

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