

CRITICAL ISSUES FOR LONG-TERM CLIMATE MONITORING *

THOMAS R. KARL¹, VERNON E. DERR², DAVID R. EASTERLING¹,
CHRIS K. FOLLAND³, DAVID J. HOFMANN², SYDNEY LEVITUS⁴,
NEVILLE NICHOLLS⁵, DAVID E. PARKER³ and GREGORY W. WITHEE⁶

¹NOAA/NESDIS/NCDC, Federal Building, Asheville, NC 28801, U.S.A.

²NOAA/OAR/ERL, 325 Broadway, Boulder, CO 80303, U.S.A.

³Hadley Centre/UKMO, London Rd., Bracknell, Berkshire RG12 2SY, U.K.

⁴NOAA/NESDIS/NODC, 1825 Connecticut Ave., NW, Washington D.C., U.S.A.

⁵BMRC, 180 Lonsdale, Melbourne, Australia

⁶NOAA/NESDIS, Federal Building #4, Suitland, MD 20233, U.S.A.

Abstract. Even after extensive re-working of past data, in many instances we are incapable of resolving important aspects concerning climate change and variability. Virtually every monitoring system and data set requires better data quality, continuity, and homogeneity** if we expect to conclusively answer questions of interest to both scientists and policy-makers. This is a result of the fact that long-term meteorological data, (both satellite and conventional) both now and in the past, are and have been collected primarily for weather prediction, and only in some cases, to describe the current climate. Long-term climate monitoring, capable of resolving decade-to-century scale changes in climate, requires different strategies of operation. Furthermore, the continued degradation of conventional surface-based observing systems in many countries (both developed and developing) is an ominous sign with respect to sustaining present capabilities into the future. Satellite-based observing platforms alone will not, and cannot, provide all the necessary measurements.

Moreover, it is clear that for satellite measurements to be useful in long-term climate monitoring much wiser implementation and monitoring practices must be undertaken to avoid problems of data inhomogeneity that currently plague space-based measurements. Continued investment in data analyses to minimize time-varying biases and other data quality problems from historical data are essential if we are to adequately understand climate change, but they will never replace foresight with respect to ongoing and planned observing systems required for climate monitoring. Fortunately, serious planning for a Global Climate Observing System (GCOS) is now underway that provides an opportunity to rectify the current crisis.

1. Introduction

Long-term climate monitoring is the process of delivering and transforming data and information to describe the state and the changing state of climate. Long-term climate monitoring requires observing and data management programs that provide observations and data bases of sufficient quality and sensitivity to address questions of interest to both policy-makers and scientists. Examples of important questions include:

* The U.S. Government and the British Crown right to retain a non-exclusive royalty-free license in and to any copyright is acknowledged.

** Data homogeneity requires ensuring that data represent changes and variations of a specific aspect of the climate system unaffected by the measuring device, processing system, or local changes in instrument exposure or other man-made modifications of the environment in the proximity of the instrument.