Analisis Kesesuaian Data Curah Hujan Satelit CHIRPS (Climate Hazard Group Infrared Precipitation with Station) Terhadap Stasiun Pengukur Hujan di DAS Citarum Hulu = Analysis of The Suitability of CHIRPS (Climate Hazard Group Infrared Precipitation with Station) Satellite Rainfall Data Against Rain Gauge Stations in the Upper Citarum Watershed

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Abstrak

Ketersediaan data curah hujan yang akurat sangat penting dalam analisis hidrologi, terutama untuk wilayah bertopografi kompleks seperti DAS Citarum Hulu. Namun, keterbatasan jumlah dan distribusi stasiun hujan di Indonesia seringkali menimbulkan bias dalam pengukuran. Oleh karena itu, data satelit CHIRPS yang memiliki cakupan spasial luas dan resolusi temporal tinggi menjadi alternatif potensial, namun tetap memerlukan validasi dan koreksi. Penelitian ini bertujuan untuk mengevaluasi kesesuaian dan keandalan data curah hujan harian CHIRPS terhadap data observasi stasiun di DAS Citarum Hulu selama periode 2013–2023. Metode evaluasi menggunakan indeks statistik Nash-Sutcliffe Efficiency (NSE), Root Mean Square Error (RMSE), Percent Bias (PBIAS), dan Mean Relative Error (MRE). Koreksi bias dilakukan dengan pendekatan Smoothing Spline Fit berbasis segmentasi intensitas hujan. Hasil penelitian menunjukkan bahwa setelah koreksi, nilai NSE seluruh stasiun berada di atas 0,83, RMSE berkisar antara 4–7, dan nilai PBIAS mendekati nol. Segmentasi intensitas hujan (sangat ringan hingga sangat lebat) terbukti meningkatkan akurasi koreksi dengan signifikan mengurangi kesalahan relatif (MRE), rata-rata hingga 85%. Dengan demikian, data CHIRPS yang telah dikoreksi terbukti andal dan representatif untuk digunakan dalam analisis hidrologi di DAS Citarum Hulu, baik sebagai sumber data alternatif maupun pelengkap terhadap pengukuran konvensional.'

.....Accurate rainfall data is essential for hydrological analysis, particularly in regions with complex topography such as the Upper Citarum Watershed (DAS Citarum Hulu). However, the limited number and uneven distribution of rain gauge stations in Indonesia often introduce biases in rainfall measurement. Satellite-based rainfall estimates, such as CHIRPS, offer a promising alternative due to their wide spatial coverage and high temporal resolution, though their accuracy must be evaluated and corrected. This study aims to assess the suitability and reliability of daily CHIRPS rainfall data compared to ground-based observations from 20 rain gauge stations in the Upper Citarum Watershed for the period 2013–2023. The evaluation methods include statistical metrics such as Nash-Sutcliffe Efficiency (NSE), Root Mean Square Error (RMSE), Percent Bias (PBIAS), and Mean Relative Error (MRE). Bias correction was conducted using the Smoothing Spline Fit method with segmentation based on rainfall intensity. The results show that after correction, all stations achieved NSE values above 0.83, RMSE values between 4–7, and PBIAS values close to zero. The use of rainfall intensity segmentation (very light to very heavy) significantly enhanced correction performance, reducing MRE by an average of 85%. These findings demonstrate that the corrected CHIRPS data is highly accurate and stable across statistical metrics, making it suitable as an alternative or complementary rainfall data source for hydrological applications in the Upper Citarum Watershed.