IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

Anilloy Frank
Dept Electronics and Communication Engineering
Presidency University
Bangalore

Sanjana.B.K
Dept Computer Science Engineering
Presidency University
Bangalore

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com
PIONEERING EDUCATION PARADIGMS

INTRODUCTION:

- Climate change involves long-term changes in climatic factors caused by natural phenomena (e.g., sun's activity, volcanic eruptions) and more recently, human activities as the primary driver.
- Climate significantly affects daily life, including clothing, transportation, food production, health, and wildlife. Since the industrial revolution, global temperatures have risen by 1°C, emphasizing the need for study and adaptation.
- The May 2023 global climate report highlights rising temperatures, with May 2023 being the third warmest month recorded globally. Historical data shows a shift from below-average temperatures (before 1930) to rising averages since the 1980s.
- It predicts harsh weather events and future trends like rainfall and temperature changes, helping prepare and adapt to environmental shifts. Policymakers can use this understanding to craft strategies to mitigate contributing factors and manage impacts.

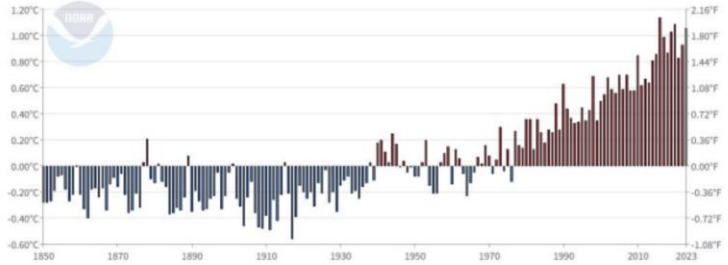

Fig. 1: Land and Ocean Global Climate comparision with the 20th-century average of 14.8C [1].

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com

LITERATURE REVIEW:

PAPER NAME	RELEVANCE
Smart weather forecasting using machine learning: a case study in tennessee [4]	This paper uses historical data from multiple sources to train a machine learning model for weather prediction. Reduces computational costs and improves prediction accuracy compared to traditional methods.
Long-term trends in rainfall and temperature using high-resolution climate datasets in East Africa [6]	This study analyzes long-term rainfall and temperature trends using historical data. Emphasizes spatial variability in climatic changes for localized weather analysis
Trend and periodicity of temperature time series in Ontario [13]	This paper applies statistical techniques to analyze long-term temperature trends. Its methodology includes decomposing temperature variance into trend, random, and periodic components

Summarizing the earlier work are studies or approaches that focus on implementing methods of weather forcasting and examine various methods. However, the proposed approach emphasis is analysing historical data to determine regional weather patterns.

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com

THE PROPOSED APPROACH:

- The approach analyzes Karnataka's local weather from 1951-2020, focusing on mean surface air temperature and precipitation to assess regional trends and predict future changes, aligned with SDG Goal 13 - Climate Action.
- Datasets are sourced from the Climate Change Knowledge Portal (CCKP), covering variability, trends, and trends with variability for different weather parameters in India.
- Analysis tools include Google Colab for data visualization using libraries like Pandas, Numpy, Matplotlib, Seaborn, and Linear Regression, while Excel is used to calculate the decade-wise change in average mean surface air temperature.
- The dataset is analyzed using scatter plots for variability and trends, distribution plots for peak shifts, and trend lines to evaluate slope changes over different periods to identify increases or decreases in weather parameters.

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com

EVALUATION AND RESULTS:

A. Variability and trends of Average mean surface air temperature across seasonal cycle of Karnataka region (Fig.2)
B. Variability and trends of Precipitation across seasonal cycle of Karnataka region (Fig.3)

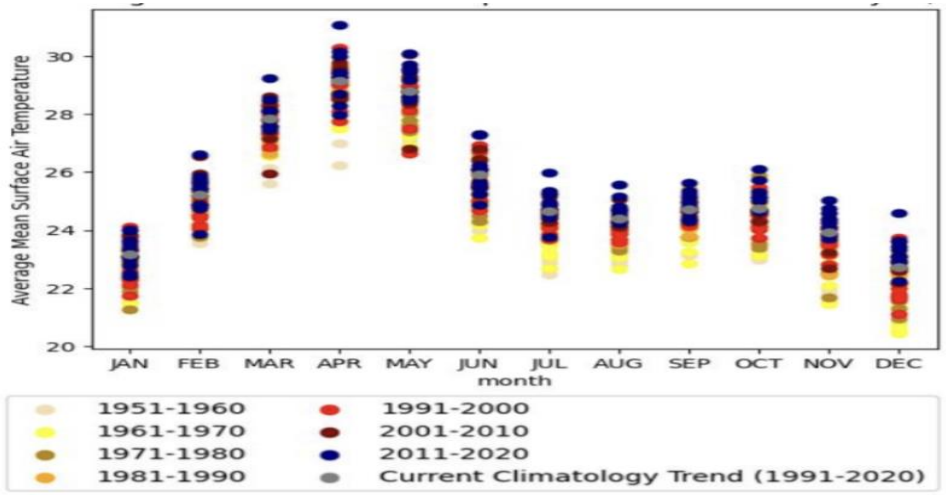

Fig. 2: Variability and trends of average mean surface air temperature across seasonal cycle of Karnataka region.

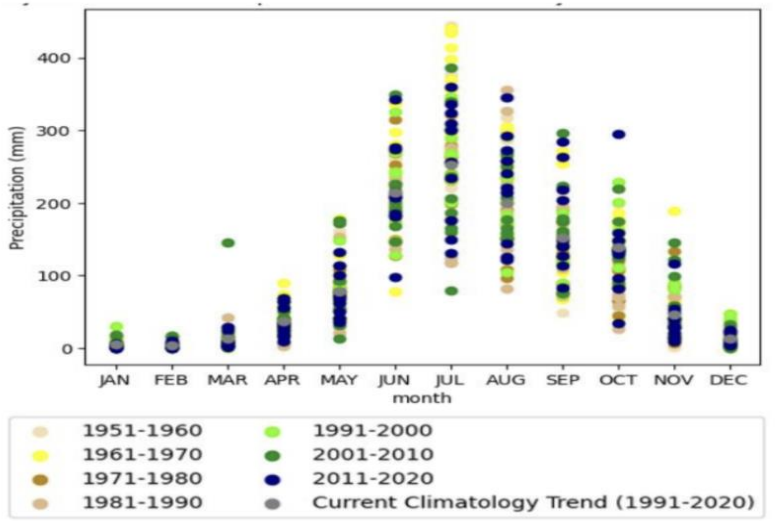

Fig. 3: Variability and trends of precipitation across seasonal cycle of Karnataka region.

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com
PIONEERING EDUCATION PARADIGMS

EVALUATION AND RESULTS:

C. Change in distribution of Average mean surface air temperature of Karnataka region (Fig.4)
D. Change in distribution of Precipitation of Karnataka region (Fig.5)

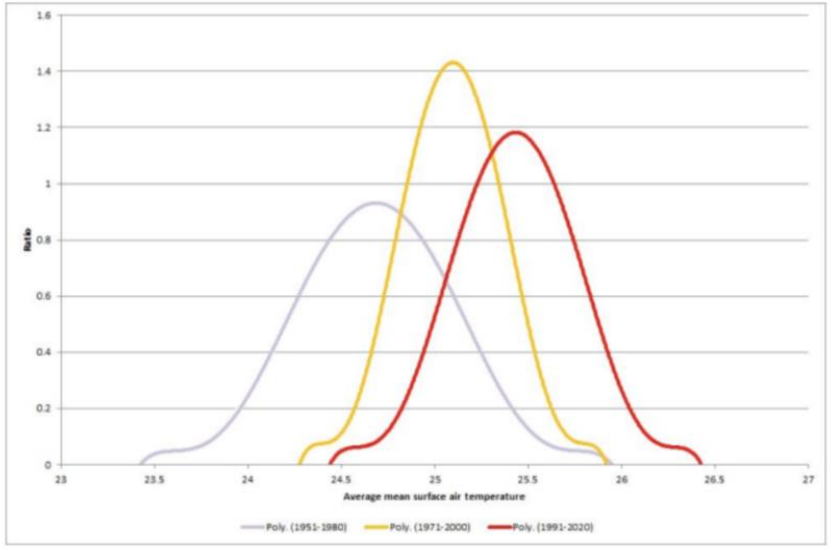

Fig. 4: Change in distribution of Average mean surface air temperature of Karnataka region.

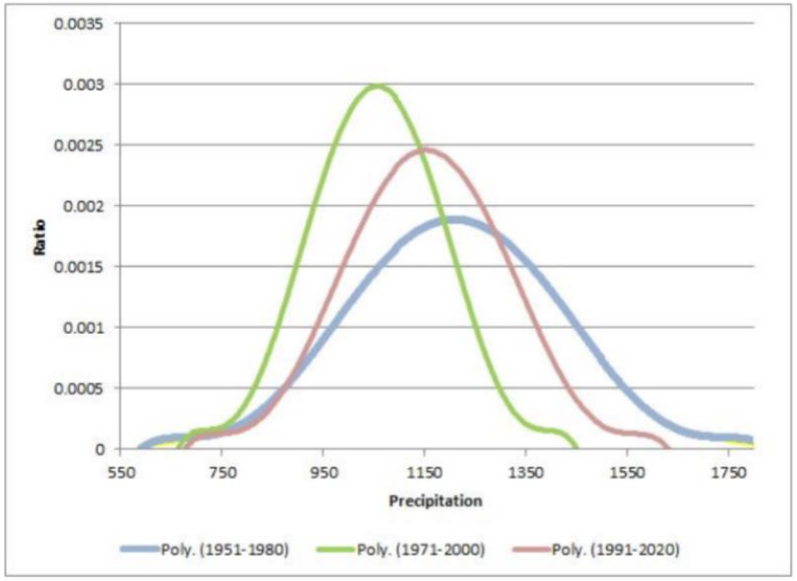

Fig. 5: Change in distribution of Precipitation of Karnataka region.

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com
PIONEERING EDUCATION PARADIGMS

EVALUATION AND RESULTS:

E. Trend line of the Average mean surface air temperature per decade of Karnataka region(Fig.6)
F. Trend line of Precipitation per decade of Karnataka region (Fig.7)

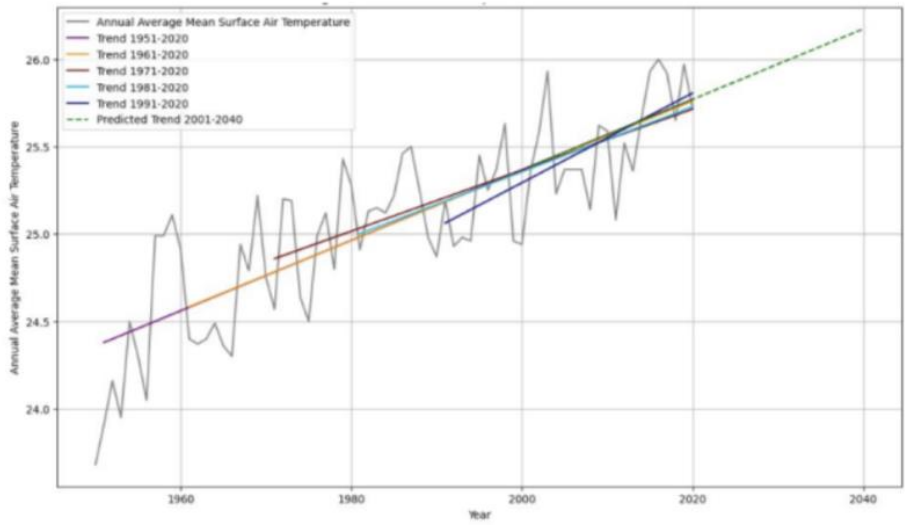

Fig. 6: Trend line of the Average mean surface air temperature per decade of Karnataka region.

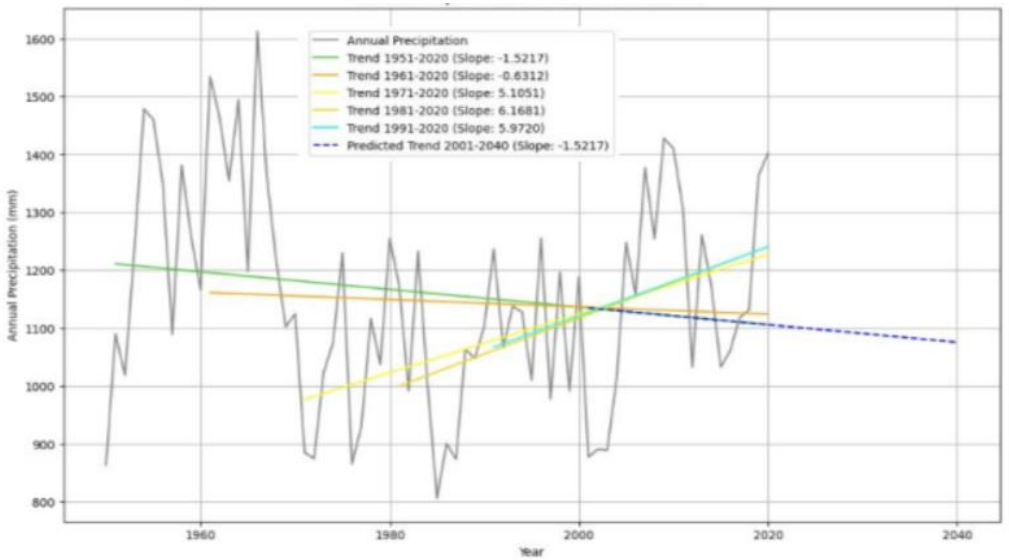

Fig. 7: Trend line of Precipitation per decade of Karnataka region.

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
www.mosicom2024.com

CONCLUSION:

- The approach analyzes historical weather data from the Climate Change Knowledge Portal (CCKP) for Karnataka (1950-2020) and predicts future changes in temperature and precipitation for the next two decades.
- Various visualization techniques, such as scatter plots for monthly variations, density plots for peak shifts, and line plots for overall trends, are used to analyze surface air temperature and precipitation changes across decades.
- The analysis, conducted using Google Colab and Excel, reveals a gradual increase in surface air temperature and a decrease in precipitation, with predictions for 2001-2040. The incorporation of local city-based data helps predict regional extreme weather events for better preparedness.

Analysis of Historical Weather of Karnataka, India for Insights in Climate Trends-33

IEEE
(Conference record number # 63082)
3rd International Conference on
Modeling, Simulation & IntelligentComputing
(MoSICom 2024)
9-11 December, 2024
PIONEERING EDUCATION PARADIGMS

REFERENCES:

[1] National Centre for Atmospheric Science, “Housing Data Tables,” National Buildings Organisation, Ministry of Housing and Urban Affiars,India, 2011.
[2] Y. NarasimhaRao, P.S. Chandra, V. Revathi, and N.S. Kumar, “Providing enhanced security in IoT based smart weather system,” Indonesian Journal of Electrical Engineering and Computer Science, vol.18, pp.9-15.
[3] M.P. Raju, and A.J. Laxmi, “IOT based online load forecasting using machine learning algorithms,” Procedia Computer Science, vol. 171, pp.551-560, 2020.
[4] A.H.M. Jakaria, M.M. Hossain, and M.A. Rahman, “Smart weather forecasting using machine learning: a case study in tennessee,” arXiv preprint arXiv:2008.10789, 2020.
[5] M.S. Rahman, F.A. Tumpa, M.S. Islam, A. Al Arabi, M.S.B. Hossain, and M.S.U. Haque, “Comparative Evaluation of Weather Forecasting using Machine Learning Models,” 26th IEEE International Conference on Computer and Information Technology (ICCIT), pp. 1-6, 2023.
[6] S.H. Gebrechorkos, S. Hlsmann, and C. Bernhofer, “Long-term trends in rainfall and temperature using high-resolution climate datasets in East Africa,” Scientific reports, vol. 9, pp. 11376, 2019.
[7] J. Murphy, “Predictions of climate change over Europe using statistical and dynamical downscaling techniques,” International Journal of Climatology: A Journal of the Royal Meteorological Society, vol. 20,pp.489-501, 2000.
[8] H. Tatli, H.N. Dalfes, and S.S. Mente, “Surface air temperature variability over turkey and its connection to largescale upper air circulation via multivariate techniques,” International journal of climatology, vol. 25,pp.331-350, 2005.
[9] M.H. Dore, “Climate change and changes in global precipitation patterns: what do we know?,” Environment international, vol 31, pp.11671181, 2005.
[10] C.M. Stephens, F.M. Johnson, and L.A. Marshall, “Implications of future climate change for event-based hydrologic models,” Advances in Water Resources, vol. 119, pp.95-110, 2018.
[11] R. Singh, R.K. Pal, K.K. Gill, S.K. Mishra, and A. Kaur, “Validation of medium range weather forecasts and its economic impact on cotton-wheat cropping system in South-Western Punjab,” MAUSAM, vol. 73,pp.915-928, 2022.
[12] H.X. Do, S. Westra, and M. Leonard, “A global-scale investigation of trends in annual maximum streamflow,” Journal of hydrology, vol. 552, pp.28-43, 2017.
[13] S.I. Ahmed, R. Rudra, T. Dickinson, and M. Ahmed, “Trend and periodicity of temperature time series in Ontario,” American Journal of Climate Change, vol. 3, p. 272, 2014.
[14] C. Wasko, and R. Nathan, “Influence of changes in rainfall and soil moisture on trends in flooding,” Journal of Hydrology, vol. 575, pp.432441, 2019.
[15] P. Sharma, and S. Prakash, “Real time weather monitoring system using IoT,” In ITM web of conferences EDP Sciences, vol. 40, 2021.
[16] United Nations, “Sustainable Development Goals,” United Nations Department of Economic and Social Affairs, https://sdgs.un.org/goals,[assessed on: 01/03/2024]