



## **Effects of weather anomalies on the intellectual performance: Chess mistakes of the world top-ranked players**

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Weather disturbances like fronts, influence human biorhythm, our biological balance becomes manipulated, and adaptation mechanisms are impaired. Our working hypothesis is that even the best chess players of the world are not exceptions from this rule. As their movements on the chess board, as well as the best possible ones, if they missed to make, are already assessed by computers objectively, we can use this game as a model of intellectual performance. By the date of the Abstract edition, 580 wrong chess moves were selected with the threshold of over 1/3 peasant to be lost. I.e. this is the minimum difference between the assessment of the positions after the best possible and the really performed move. (Obviously, all moves both sides in ca. the same number of games were checked, i.e. over 35,000 moves were assessed.)

For assessing the moves, the most popular database is MegaDatabase 2006 (ChessBase- Hamburg), Chess Informant Expert from Chess Informant Beograd and the program ChessBase 9.0 together with the engines Fritz 10, Rybka 2.3, Junior 10. First of all the World Chess Champions, Karpov, Kasparov, Kramnik and Anand were examined played in the traditional big chess tournaments, category 19th and more (average rating more the 2701 Elo-points). We further selected the games by the top-ranked players of the world between 2005 and 2008. This selection is explained by the likely fact that they make the less wrong moves for simply the lack of chess understanding, moreover, as full professionals, they allow the minimum of non-weather disturbing circumstances (e.g. imperfect sleeping before the game, etc.).

Their moves were selected as (i) very wrong move with more than 3.0 differences, (i.e. unforced loss of a knight, or a bishop, (ii) very weak move with an assessment of 1.0-3.0, (i.e. unforced loss between one peasant and one bishop/knight) and (iii) weak move with less than 1.0 assessment of the passed chance, or unforced loss of less than one peasant. These new data on mental behavior are statistically compared to a common set of diurnal meteorological parameters, including various near-surface and lower troposphere temperature values, sea-level pressures, relative topographies, precipitation amount and existence (duration) and wind speed. The data and the aerologic fields are retrieved from the ECMWF ERA-40 (until 2002) and ECMWF operational analysis (after 2002) for the date and site of the individual mistakes.

According to our preliminary results, the wrong moves fall to the lower or higher than average parts of the diurnal mean temperature distribution. Even if we should be careful because of the well known bi-modal distribution of the temperature (if not performing any seasonal correction), but, even after considering these differences the best players make more frequent mistakes in case of higher or lower than normal temperature situations. Another preliminary experience is that decreasing tendency of the RT850/500 hPa relative topography also indicates increase of wrong and very wrong moves. After performing this analysis, the result will be compared to the better known empirical paradigms of medical meteorology and experimental psychology.