R17a Development of the Multi-Parameter Star Formation Law: II

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In ASJ 2013b (R23a), we reported on the discovery of a set of scaling relations between physical conditions of the ISM and star formation activities at the scale of GMCs, utilizing the principle component analysis. Physical parameters considered were star formation rates, total molecular gas masses, dense molecular gas masses, stellar masses, dust masses and evolutionary stages of GMCs. Here we present a re-analysis of the results with updated data. The two CO lines show the strongest correlation, with minor modulations from the star formation rate. The correlation between dust mass and star formation rate is also prominent, indicating that dust may trace molecular gas better than CO at these scales. In order to verify these results in another galaxy, we further present results from an ASTE 12CO(J=3-2) survey of 42 star forming regions within the southern spiral galaxy NGC300. We compare the 12CO(J=3-2) flux with 12CO(J=2-1) detections at APEX, catalogued star formation rates, stellar cluster ages, and dust emission from the literature. The relations are consistent with those observed in M33.