

# Annual Cycle of Surface Radiation Budget

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**CERES Science Team Meeting  
28-30 April 2009  
Newport News, Virginia**



# Objective

- To quantify the Annual Cycle of SRB Fluxes:

Shortwave Net      SWnet

Longwave up      LWup

Longwave down      LWdown



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# Data Set

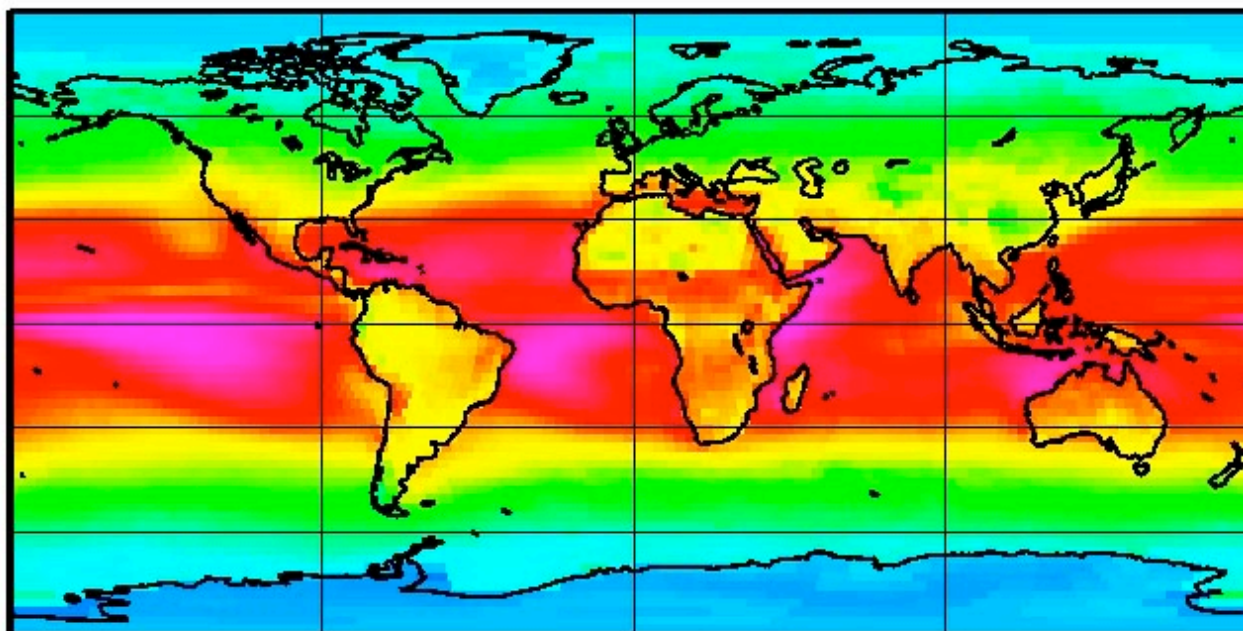
- Study uses NASA/GEWEX SRB data set Release 2.5 for Longwave, Release 3.0 for Shortwave Fluxes.
- 1° lat-long quasi-equal area grid.
- Monthly-mean maps for 1983-2005 averaged to give climatological mean fluxes.



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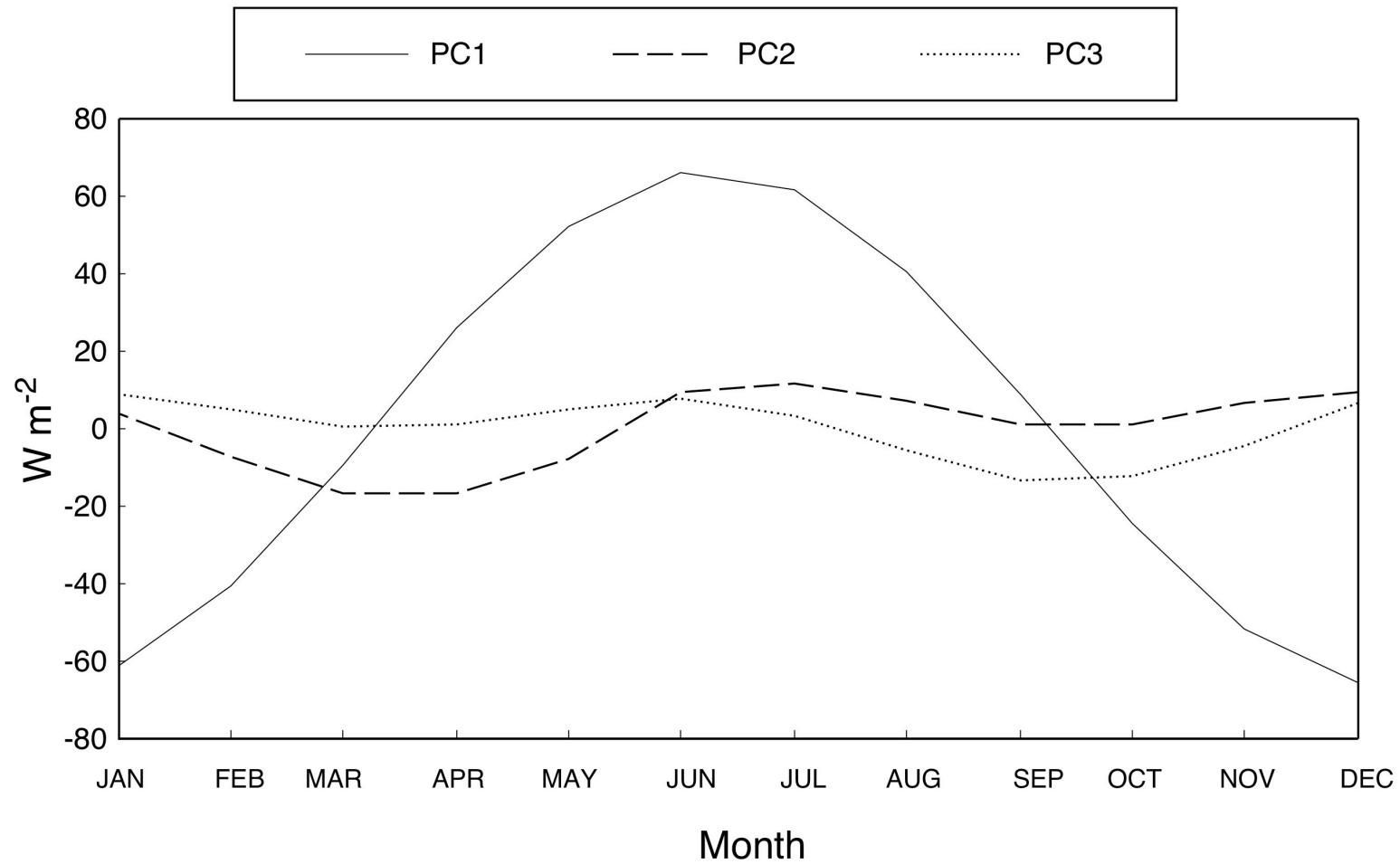
Mean Annual Net Shortwave Radiation Flux ( $\text{W m}^{-2}$ ).



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## Principle Components of SWnet Annual Cycle

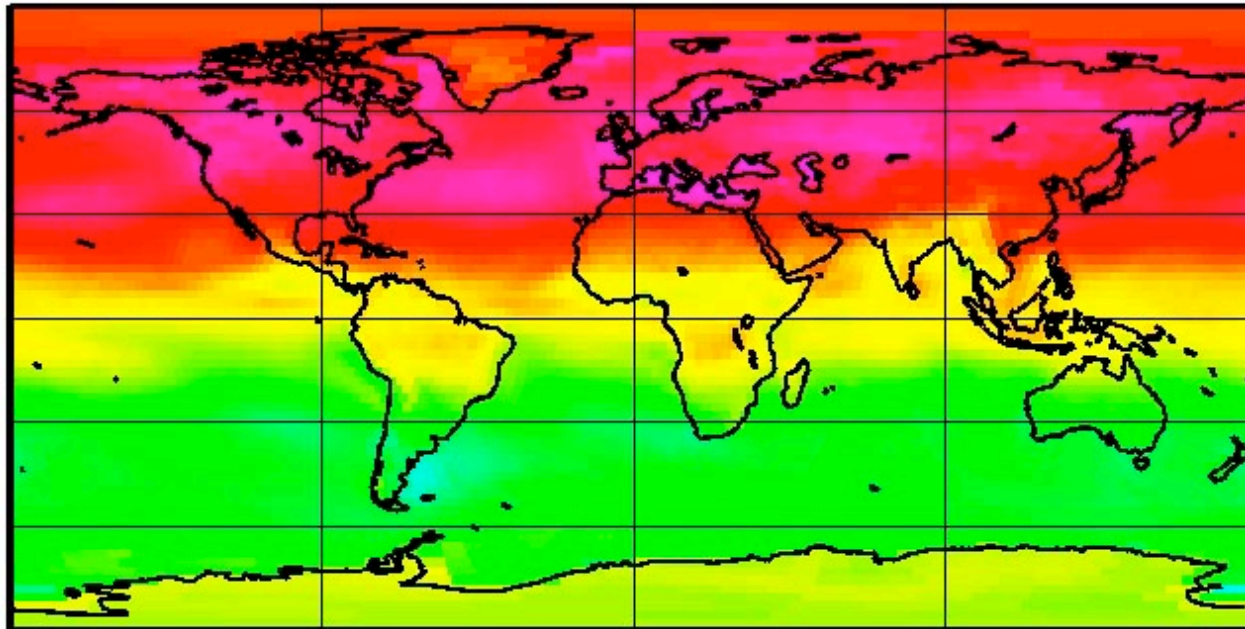


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## Shortwave Net Flux

EOF 1

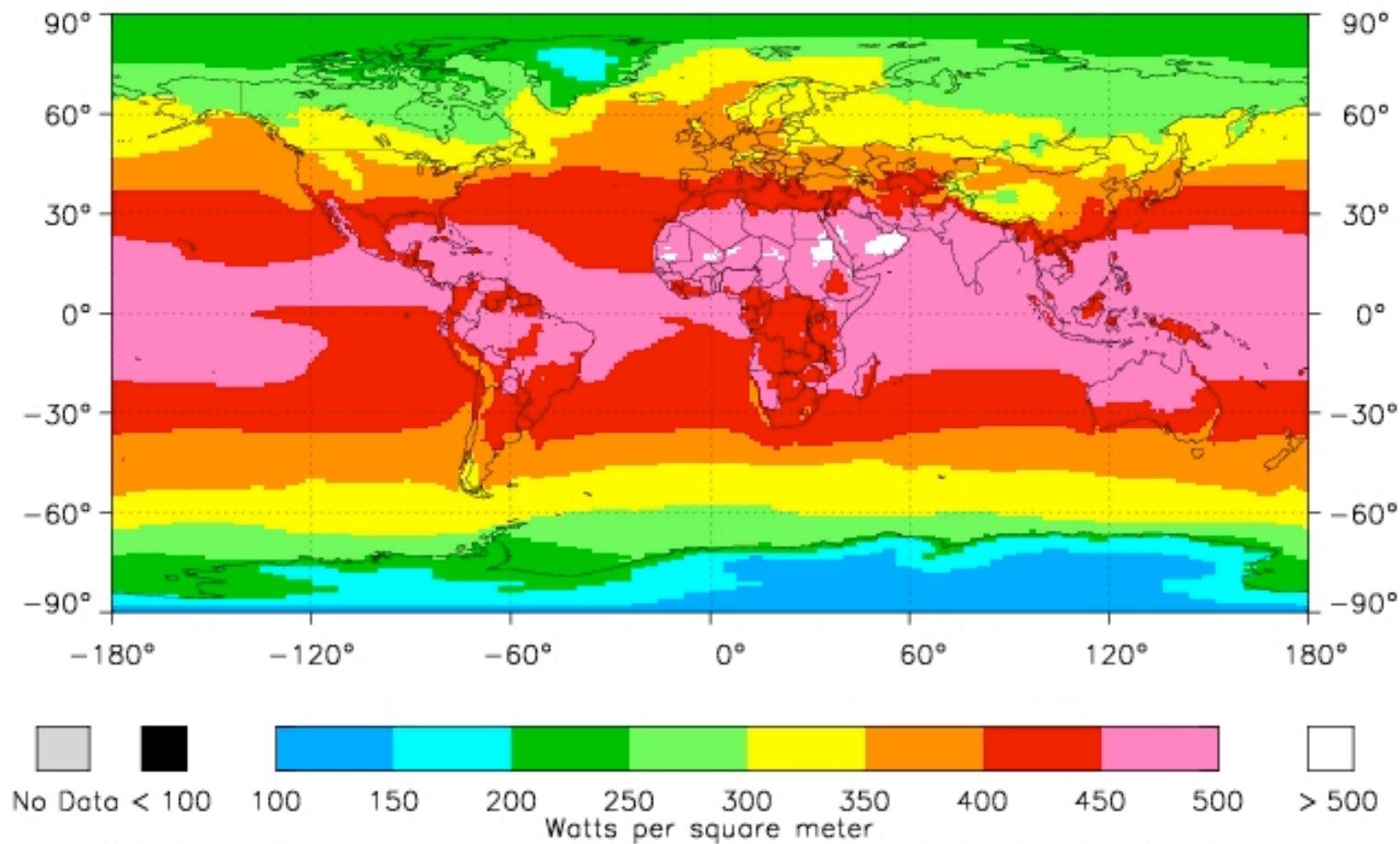


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SRB SRB Mean of LW Up Flux  
Annual

INPUT FILE: mean\_LWup\_loc.dat



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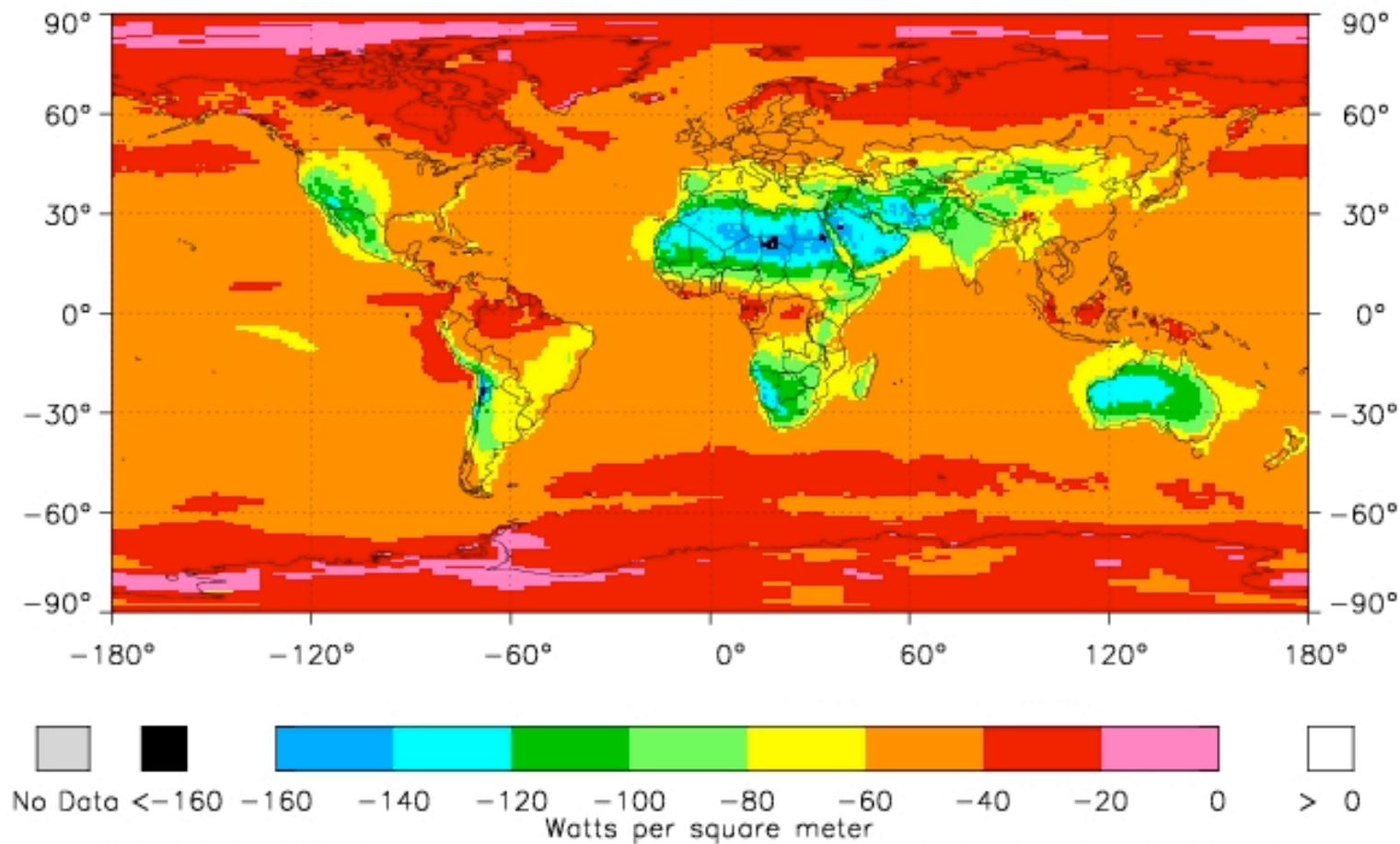




# SRB Mean LW Net Flux

Annual

INPUT FILE: mean\_LWnet\_loc.dat



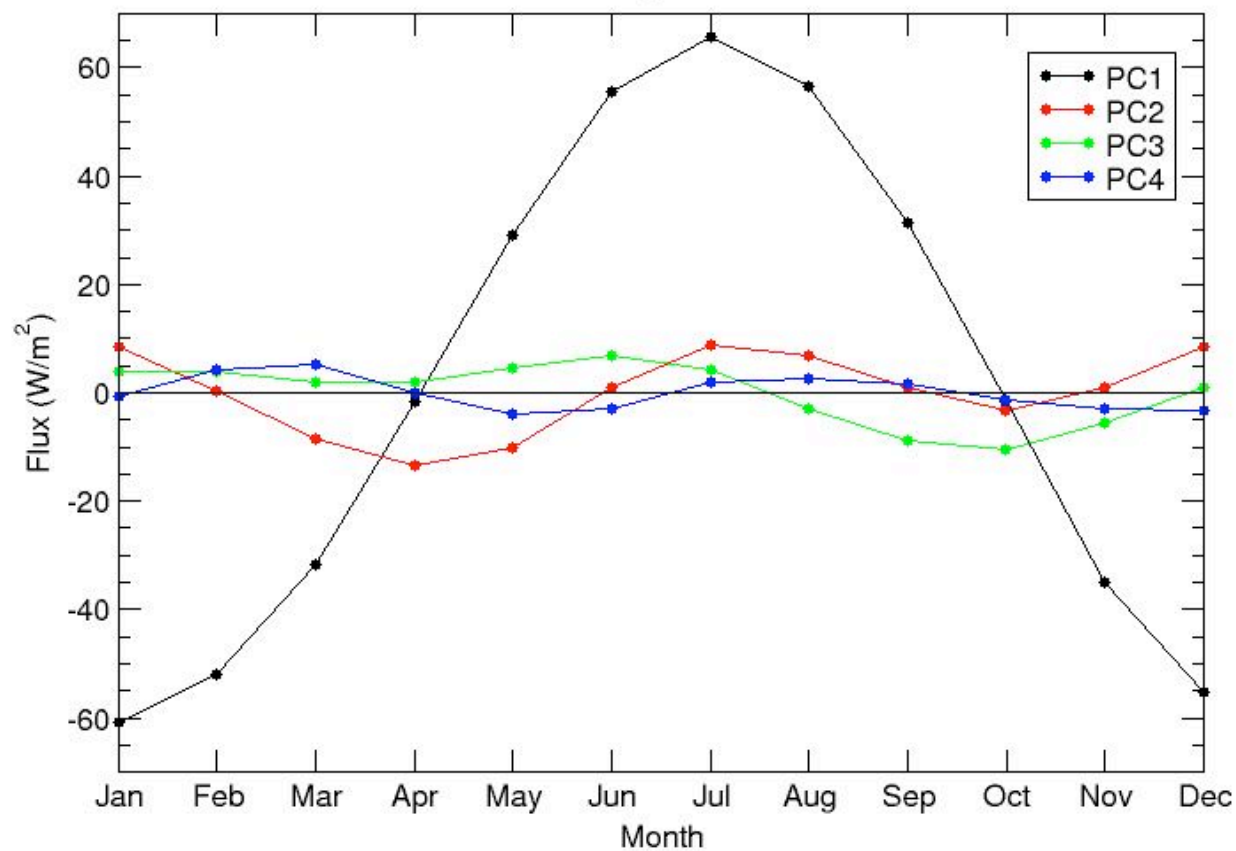
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## Principal Components for LW Up

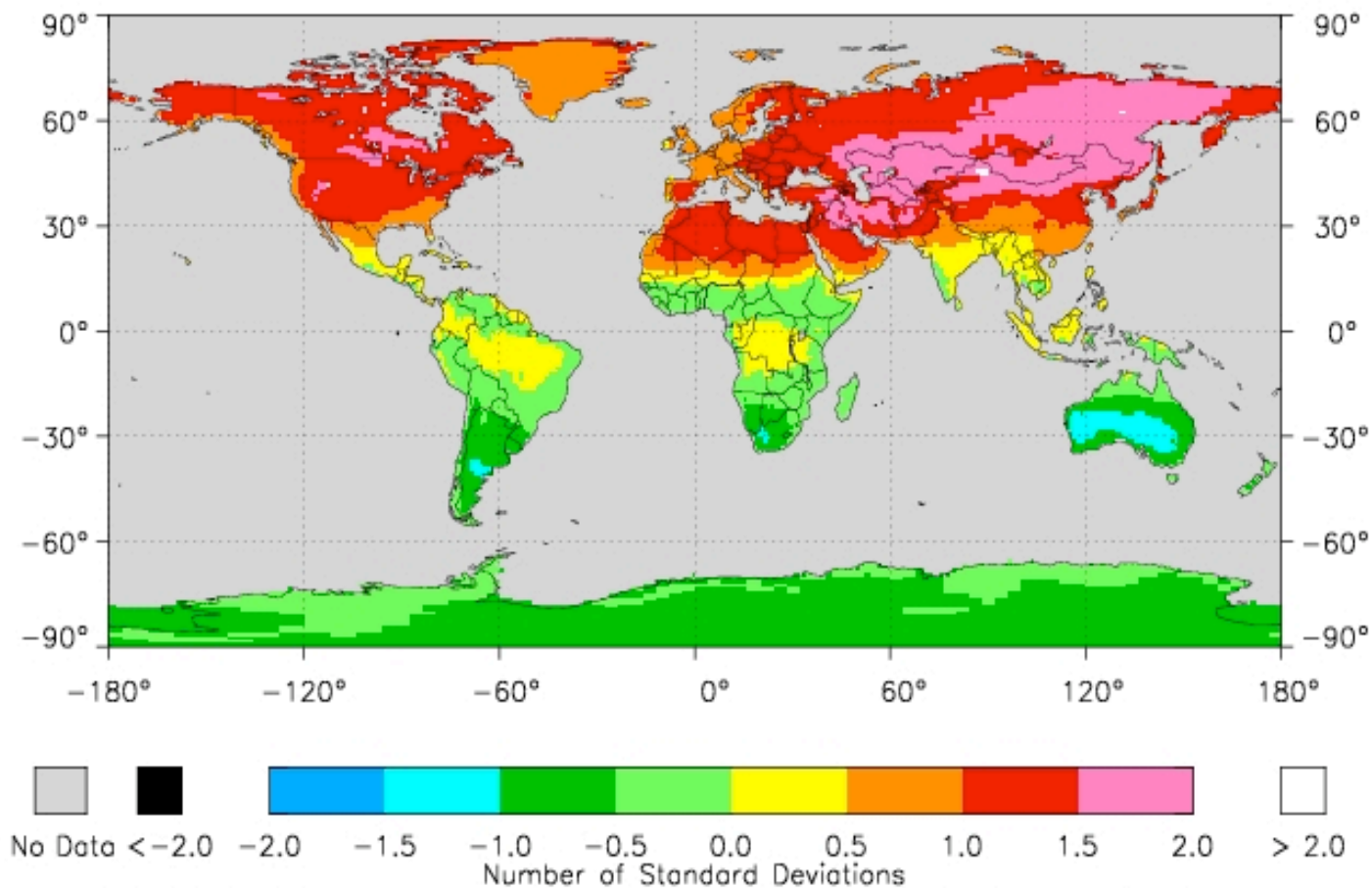
Land only; SRB 2.5



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## Annual Cycle of LWup over land, EOF-1

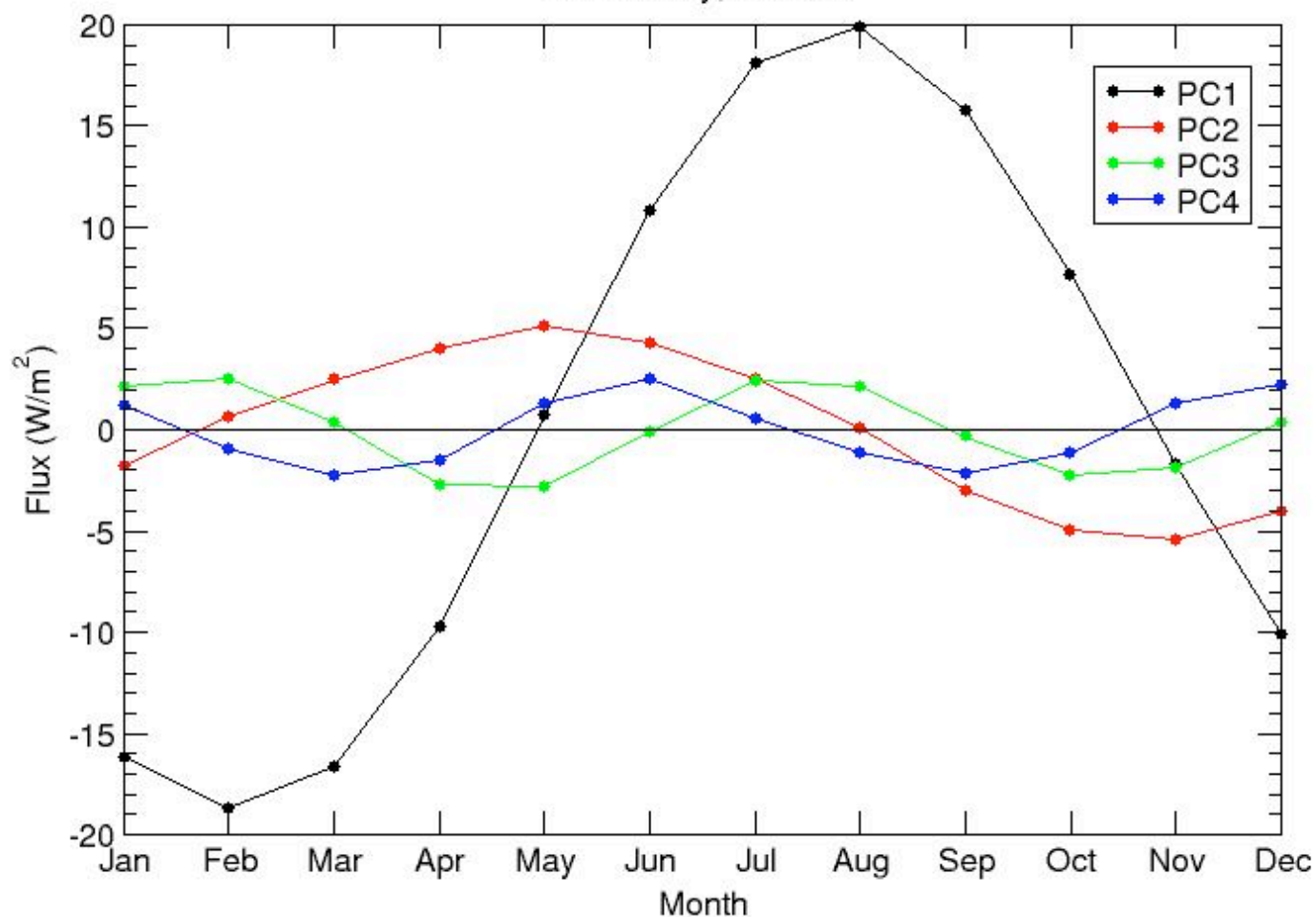


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## Principal Components for LW Down

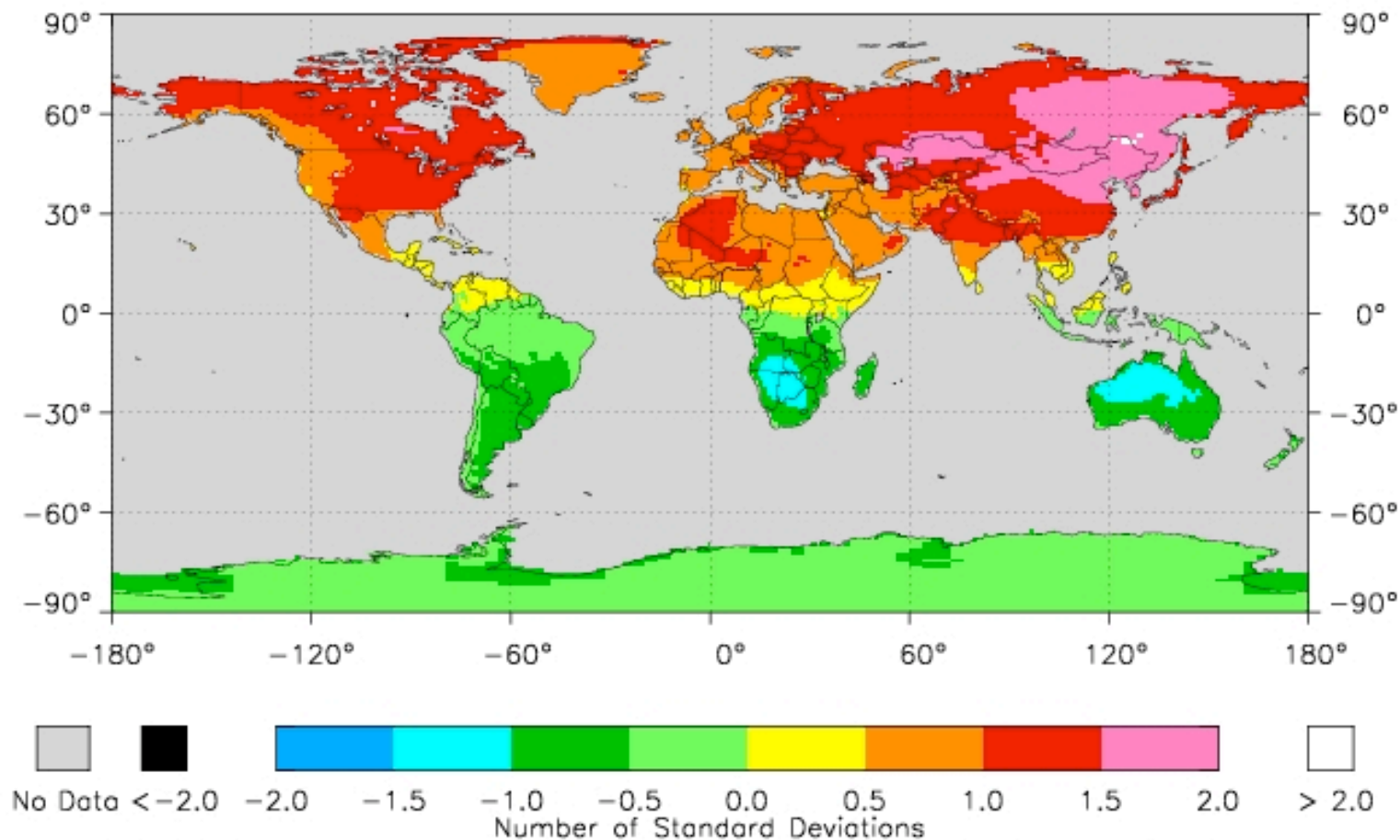
Ocean only; SRB 2.5



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## Annual Cycle of LWup over land, EOF-1



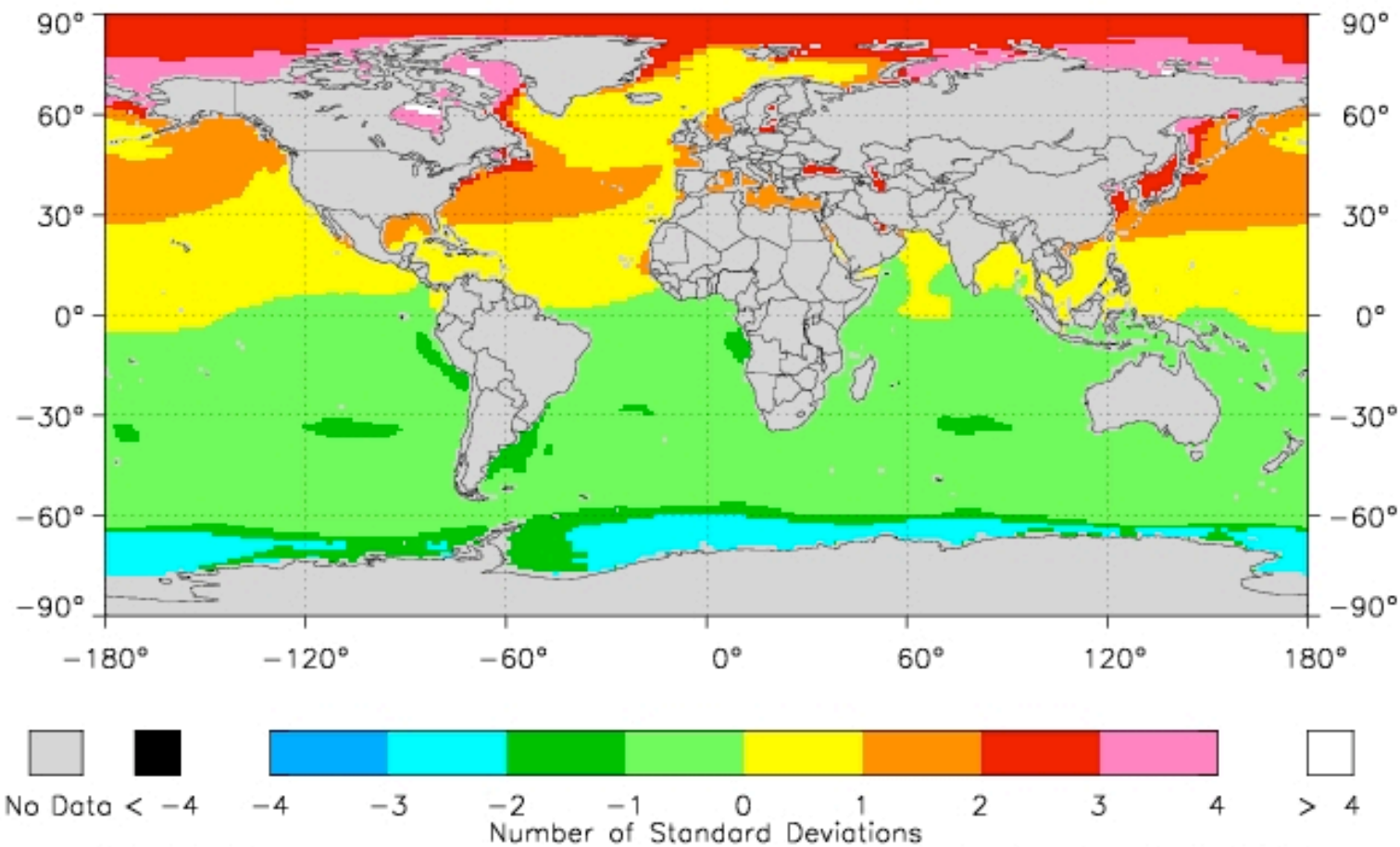
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# SRB EOF-1 ocean only

Annual

INPUT FILE: evec\_LWup\_ocean.dat



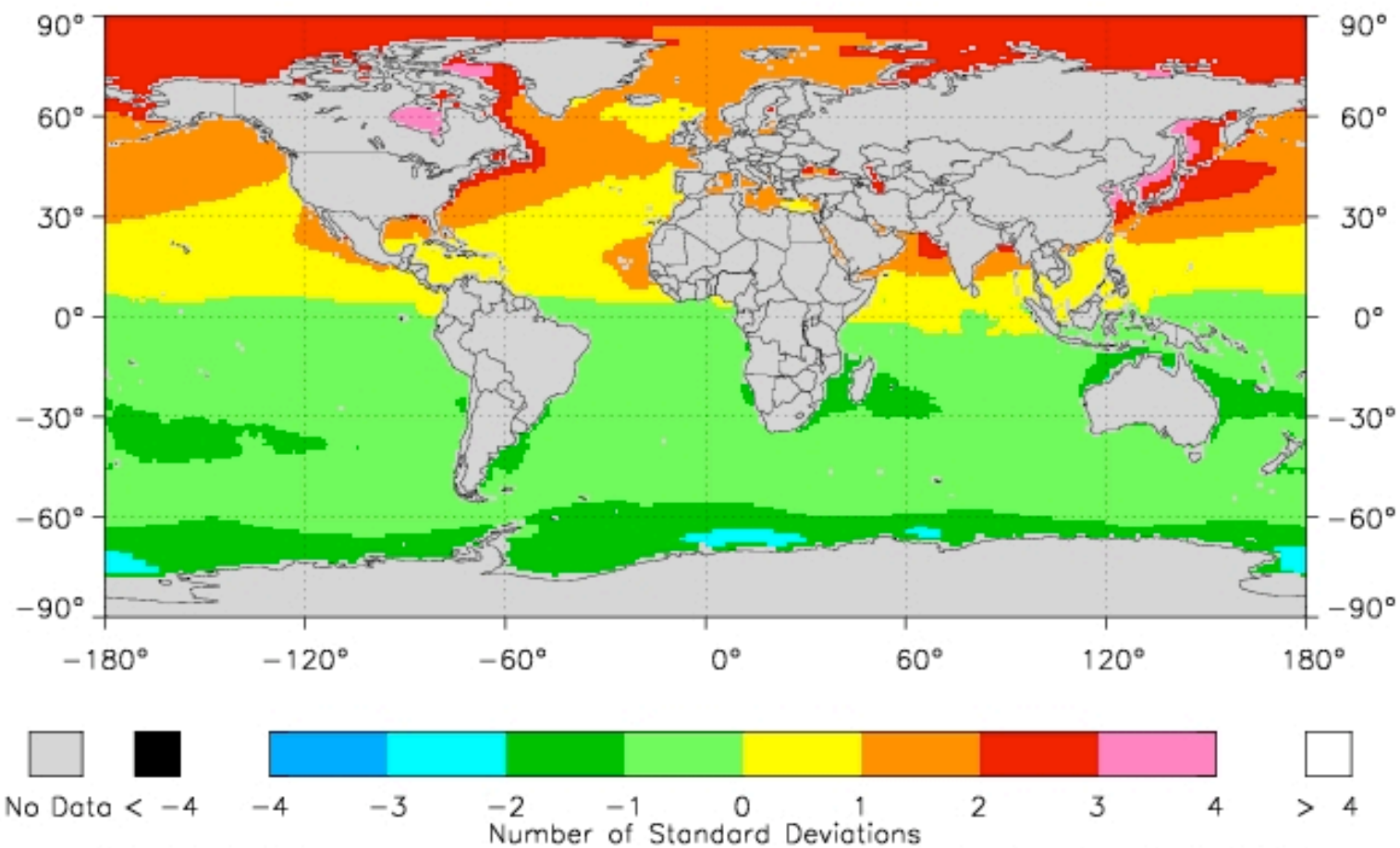
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# SRB EOF-1 ocean only

Annual

INPUT FILE: evec\_LWdown\_ocean.dat



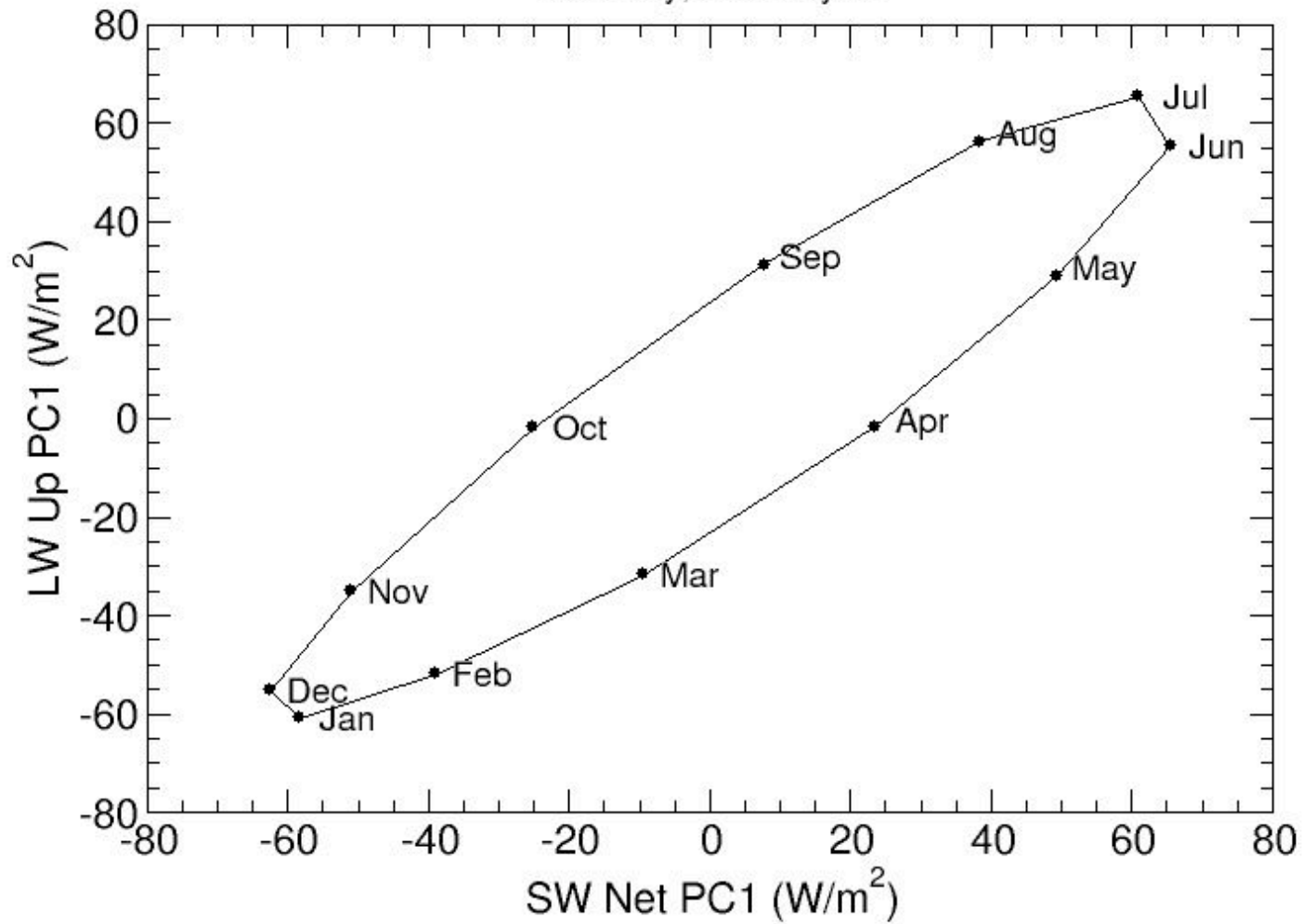
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## LW Up PC1 vs SW Net PC1

Land only; Annual cycle



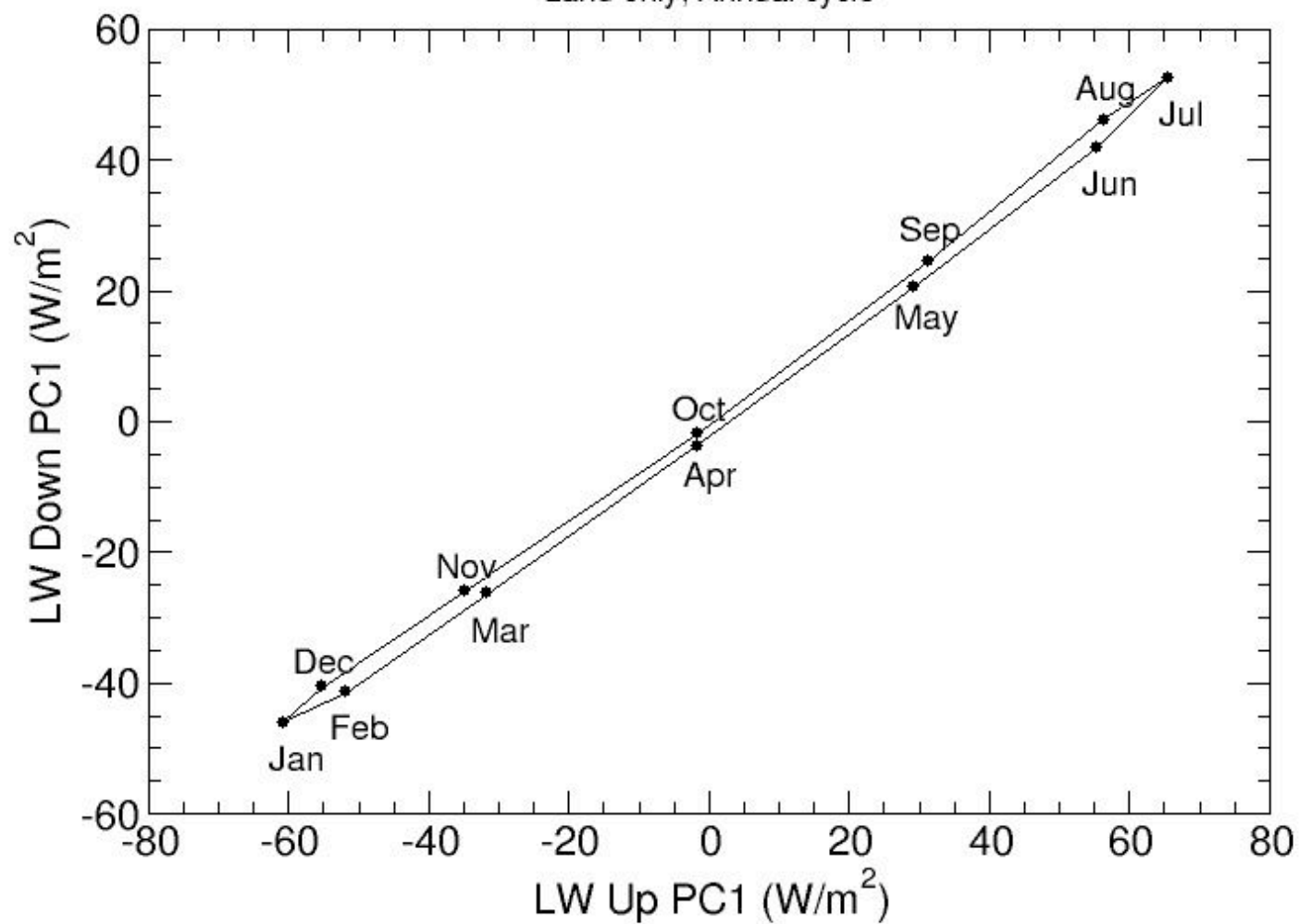
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## LW Down PC1 vs LW Up PC1

Land only; Annual cycle

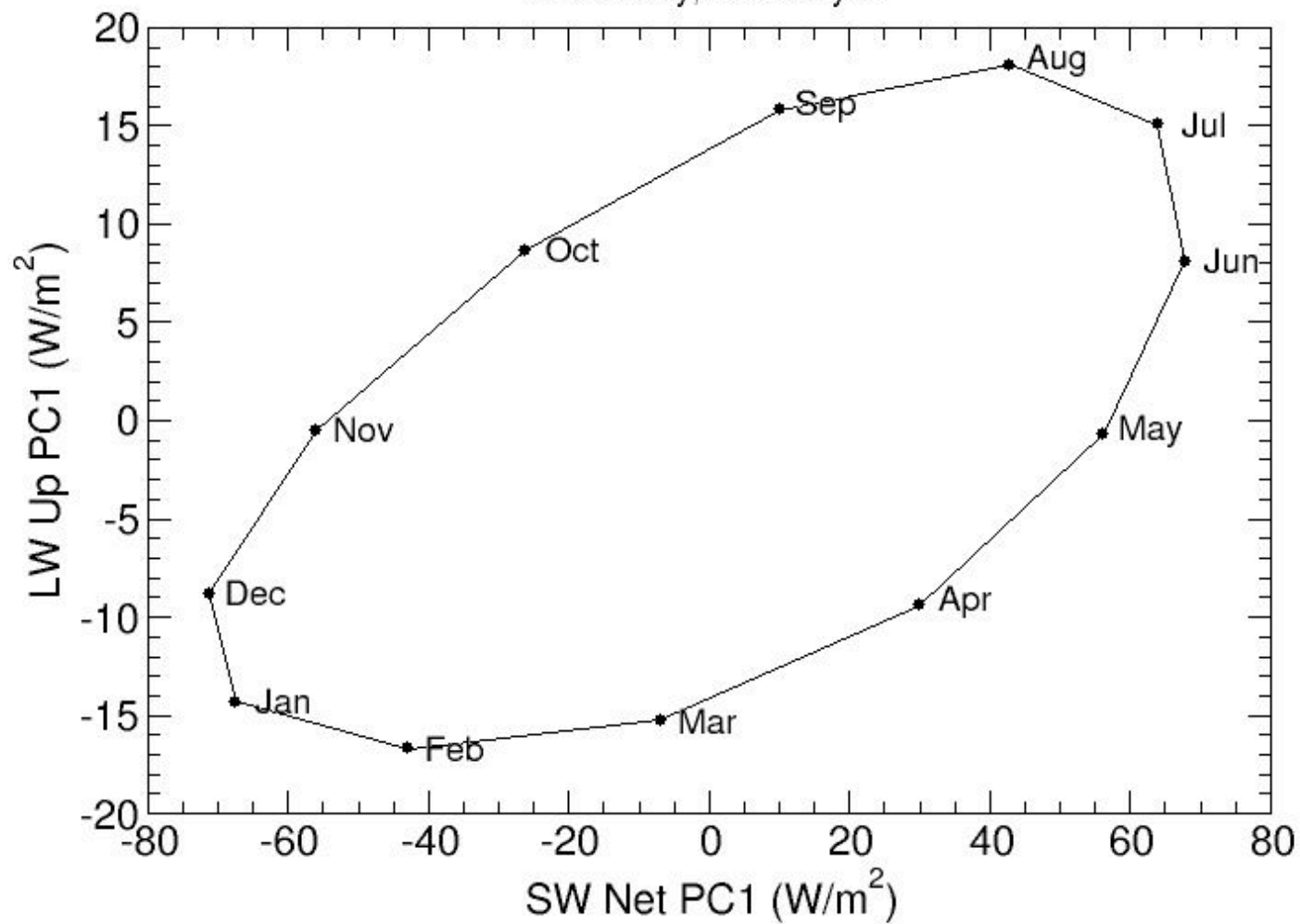


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## LW Up PC1 vs SW Net PC1

Ocean only; Annual cycle

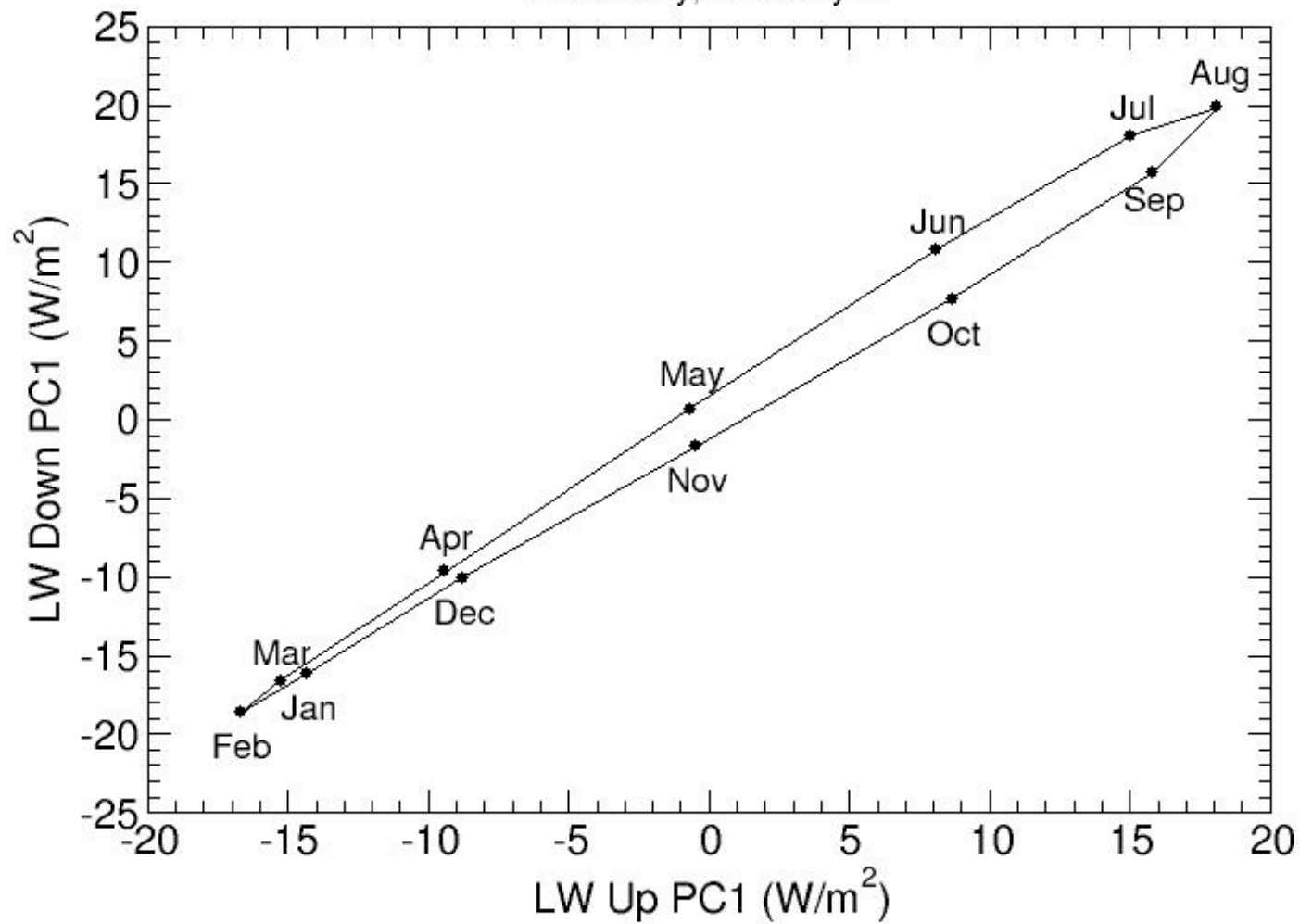


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## LW Down PC1 vs LW Up PC1

Ocean only; Annual cycle



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# Conclusions

- Over land the Annual Cycle of SWnet is  $\pm 60$   $\text{W}\cdot\text{m}^{-2}$  RMS
- Over land the Annual Cycle of LW up is  $\pm 60$   $\text{W}\cdot\text{m}^{-2}$  RMS and lags SWnet by 40 days
- Over land the Annual Cycle of LWdown is  $\pm 55$   $\text{W}\cdot\text{m}^{-2}$  RMS and is in phase with LWup
- Over Ocean the Annual Cycle of LWup is  $\pm 18$   $\text{W}\cdot\text{m}^{-2}$  and lags SWnet by  $\sim 3$  months
- Over Ocean the Annual Cycle of LWdown is  $\pm 20$   $\text{W}\cdot\text{m}^{-2}$  and leads the Ocean LWup



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